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THE

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THE IRON AGE

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THIS WEEK IN THE

IRON AGE

Vol. 157, No. 1 January 3, 1946

Ninety-First Annual Review Issue

Editorial

Review Articles

Features

News and Markets

THE
IRON AGE
ESTABLISHED 1855

January 3, 1946

Your Best Friends Won't Tell You

MY anonymous communistic correspontent in Chicago hasn't written me recently. And there is no other way than this to let him know that I miss his weekly postcards, for I do not know his address. Perhaps he withheld this purposely, fearing that I might write to his boss and try to get him fired. That I would not have done for worlds, not merely because it wouldn't be ethical, or sporting, if you prefer that term, but because I valued his caustic criticisms of the thoughts expressed on this page. As long as he disapproved of what I wrote, and he did so in terms that left little to the imagination, I knew that I was on the right track. But alas, I have not heard from him for weeks and am worried as to whether he is slipping or I am.

However, this reliable barometer, which has now gone out of whack, gaged only one page of the 70 to 80 pages that we publish week in and out. He apparently never read further than this first editorial page, perhaps because it is the one page of opinion, and the rest are as factual and objective as we can make them. I often have wished that this critic would turn the pages a little farther and tell us why he didn't like so and so's article on heat-treating or welding or the news reports of what's doing in the industry.

Naturally, any publication such as THE IRON AGE, which has been in business for nearly a century, has built up a considerable correspondence with its readers, in which they take the initiative in telling the editor how good they think the publication is. This, of course, must not be confused with the correspondence that we initiate with advertisers or prospective ones, telling them how good we think it is. But while pats on the back warm the editorial spine and stiffen the resolve to deserve more of the same, there are times when a more emphatic and more jolting gesture delivered a bit lower down is beneficial.

Jack Benny, I think, hit the jackpot in connection with the current contest in which his radio listeners are offered a reward for best expressing "why they hate Jack Benny." Actually, I do not think that anyone could hate Jack, or does, but he will undoubtedly get some good constructive criticisms to better future programs out of it.

I think the idea, in modified form, is worth adopting in the publishing business. Naturally we do not expect or hope that anyone who pays $8.00 per year for a subscription to THE IRON AGE would be foolish enough to continue to read it unless he liked most of it. However, from time to time there will be, in the nature of things, something in an issue that you do not like or that you think could be improved. It may pertain to the expression of editorial opinion, to a technical subject or to an item of news coverage. Or it might relate to an advertisement, for our advertisers want constructive criticism also.

So when the spirit moves, take your pen in hand or your typewriter on your lap and tell me what in the issue of ——— you did not like and why. And you will have the satisfaction of knowing that you are helping us in the mutual endeavor to make THE IRON AGE more and more useful to the industry that it serves.

J H Van Deventer

NEWSFRONT

► Requirements for peacetime steel production appear to steel men to be adequate to support an ingot rate of 70 to 80 pct for the next several years. Analysts estimate there will be four good operating years before any serious decline.

► Openhearth producers are rapidly regaining the alloy steel business largely lost to electric furnaces during the war. Electric furnace production has dropped in the third quarter to only 51 pct of capacity compared to 86 pct in the third quarter, 1944.

► Secrecy has been lifted partially on the materials used for the jet propulsion gas turbines made by G.E. Combustion chambers are made of a modified age-hardenable Inconel, while the turbine impellers are made of a Timken alloy containing a much lower nickel content. Vitallium, containing 65 pct cobalt, 20 pct chromium and 5 pct molybdenum is used for the turbine buckets of gas turbines and turbosuperchargers.

► The only truly commercial sponge iron operation is the Warren plant which recently started production. Based on reduction of high grade magnetite concentrates, it utilizes as reducing agent principally the hydrogen component of coke oven gas. The product will be dense briquets formed by compressing fine particles of sponge iron. Costs have not been determined because all developmental problems have not yet been fully worked out.

► World trade is subject to far more governmental control now than before the war. Practically every important trading nation now has a variety of controls on imports and exchange and there is little evidence on the part of foreign governments to discontinue these controls even though contrary to the Reciprocal Trade Agreements.

► Many countries are now manufacturing products formerly imported. This trend shows signs of continuing and expanding. The effect of this development on U. S. manufacturers will be to restrict export sales of the simpler consumer products and expand exports of machinery, technical and engineering supplies and other highly specialized products. Total exports are expected to grow.

► In Britain there is some evident reluctance to taking over an industry bodily if any satisfactory means of control exists. It seems likely that through the British Iron and Steel Federation, or some modification of that organization, it will be possible for the government to plan the steel economy without buying all outstanding shares of the industry.

► The ultimate destiny of the Ruhr steel capacity still depends on policies to be determined by the United Nations. France has declared herself for international control but in general there is considerable cynicism toward such measures based on post World War I experience. Barring such a plan the French government does not seem willing to see steel made in Germany.

Some British opinion comes out strongly in favor of the return to the full 10 to 11 million ingot ton production possible with moderate repairs in order to prevent the desolation of all of western Europe during the next few years.

► Sale of U. S. government surpluses in the United Kingdom is expected to take the form of a lump disposal of everything of value located in the islands to Britain. Announcement is expected shortly after approval of the loan agreement by Congress.

Pending approval of the loan, the Army-Navy Liquidation Commission is proceeding with individual sales of specific items on a first-come first-served basis within the limitations of the Surplus Property Act.

► Shipment of passenger cars and commercial vehicles valued at $30 million is the 1946 export aim of the British Rootes Group. Light cars, the Hillman and the Sunbeam-Talbot will make up 45 pct of the total, commercial vehicles about 25 pct, and large cars the remainder.

The combine hopes to ship to 79 countries during the year. If this figure is attained, it will amount to more than a third of 1938 shipments for the entire British industry.

► British automotive engineers have formed the Motor Industry Research Assn. for the promotion of a wide field of research in matters relating to the industry.

► British steel prices, except autobody sheets, have been increased about 5 pct on Dec. 31 to compensate for increased fuel and imported ore costs. Forgings and iron castings prices have been raised about 12 per cent.

SWEPT along in a panic flight to put an atomic age two-way stretch on every lumpy American woman, the country has yet shown little willingness to appraise the more corroding legacies of war. One legacy, probably the common denominator of all of today's social and economic abnormalities, has been a deplorably complete erosion of moral standards characterized by lack of individual ethical responsibility and a conspicuous increase in individual and group selfishness.

To be sure, the sapping of moral standards is not endemic with the American people—it has always been evidenced in varying degrees in all countries, in all times. But, in the world-powerful, highly integrated and industrialized United States the accepted habit of thinking with the ductless glands alone and the race to pyramid one rationalization upon another have today their most potent capacity to bolix the works at home and garrote the world economies. In this country, belligerent furthering of individual self-interests are beginning to trip each other. And abroad, the ebbing of respect and friendship and the casual acceptance of a coming American-Russian war are hardly as comforting as the much-ridiculed naivete of Wilsonian idealism after the first world war.

In the four months elapsed since V-J Day, some 5 million dischargees have been shuffled back into the civilian economy. Some 7 million more are on the way at the rate of 1.5 million monthly. Isolated as the soldier was and beguiled by distance, he understandably painted a pastel civilian dream-life with inexorable verisimilitude. But, re-employed at wages somewhat more realistic than a vivid imagination had pictured, faced with living costs spiralling upward and a critical housing situation straining to blow its top, he is inclined to take an increasingly dim view of what Secretary of the Treasury Vinson described as "the pleasant predicament of having to learn to live 50 pct better than ever before."

So far, of course, dire forebodings of mass transitional unemployment have laid an egg. With heartening elasticity, the economy has, under the twin spurs of competition and economic expediency, absorbed 6 million workers involved in industrial demobilization and over 5 million service men, all within the span of 4 months. Some 3 million war workers shifted to peace-time jobs without interruption in employment, something like 2 million have been wending their way through unemployment compensation offices, and about 1 million disappeared into thin air and will unlikely reappear in force in the labor market. And, while popular fancy has the 2 million on compensation as deadbeats lolling around on $20 weekly for some 20 weeks, the records (see graph) show no abuse. Compensation claimants are fluid and ever-changing, with some 90 pct on the rolls for only 5 weeks before reemployment.

By next spring total unemployment (including veterans) will likely rise to a peak of 3.5 million, what with seasonal factors and secondary effects of strikes, and thereafter decline to a tight labor situation in the fall. No test, therefore, of the solvency of the $6 billion unemployment compensation trust fund will likely develop before, say, 1947. Then there may well develop considerable critical interest in the 30,000 local administrators of the compensation act, on the one hand to guard against depression of wage standards through arbitrary job referrals, and on the other hand to prevent liquidation of the fund through bureaucratic slackness and too liberal an interpreta-

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By T. W. LIPPERT
Editor

Indeed the country has reconverted itself further than the uneasy and querulous fourth quarter would imply. But bubble-blowing wanes, and "My Dreams Are Getting Better All The Time" has just slipped off the Hit Parade, as moral malaise and economic uncertainties joggle all those eager hands reaching for the much-publicized sybaritic postwar existence.

tion of what constitutes "suitable" jobs for referral.

To industry, dependent upon a fretful and partially stripped labor pool since V-J Day, the returning veteran has so far been a welcome sight, and three times as many have been rehired as the Selective Service Act requires. Well over 90 pct of all dischargees are back on jobs, and adjustment problems have been nonexistent. Rather, the novelty of and pressure to recoup a civilian niche, along with surging relief in escape from the military rat race, has made the dischargee a relatively docile, hard-working and willing employee. Contrasting this attitude with the sporadic mental and nervous instabilities of the stay-at-home labor pool, some management (which itself has not escaped a touch of war neurosis) with a weakness for wish fulfillment is inclined to glorify the veteran as a brake on a deteriorating labor situation. But, the veteran was and is a statistical cross-section of the labor pool, and after a shakedown in the transition period, his emotions and reactions to stimuli of self-interest will not likely show an identity other than the conventional pattern.

BY February or March further absorption of veterans by the metals industry will be approaching saturation, and any preferential treatment from there on in will have as its inevitable consequence some rather edgy by-play vis-a-vis management and unions.

The almost pathological short-term normalcy of returning veterans has been in rather sharp contrast to the sapped neuropsychiatrics so frequently conjured in that lurid wave of infantile emotionalism of a year or so ago. Possibly a few of the more discerning dischargees may even be convinced that by a curious inversion the wrong side of the draft board was being examined for neurosis. For, the return to an economy galloping off in various directions to the accompaniment of steady doses of straight-from-the-shoulder double talk might conceivably give the appearance of all too many stay-at-homes bucking for a section eight.

Some few dischargees sensitive to fine gradations of moral or economic niceties might even have pondered the various conflicting aberrations of the postwar scene. There is, for instance, the fulsome lip service to the virtues of free private enterprise, along with grandiose plans for further massive encroachment of the State on private enterprise which already is at best pretty amphibial in character. Or, the heaped ridicule and increasingly powerful and in great part successful attacks on price controls in a transitional inflationary scarcity economy, along with wide-eyed surprise at the whirlwind reaped in popular resentment and moves of over-compensation on the part of organized labor. Or, newspapers ink-heavy with pleas for labor and private industry spokesmen self-assuming the politically dangerous responsibility for full employment, along with acceptance of the theory of compensatory federal spending (even the CED has plumped for it) and sympathy with bringing the entire economy within the ambit of the State's concern via a full employment law. Or, the persistent sentimental picturing of industry as a loose coalition of small business, even though the entrepreneur is relatively a stranger in the industrial framework. Or, the interminable inflation-deflation wrangle. Or, rationalizing self-indulgence in hastily planned tax relief as an expediter of reconversion, only to have the incipient gush of consumer goods dry to a trickle until next year's more favorable tax climate, meanwhile flying in the face of nothing but defiicit budgets in the visible future to aggravate a debt of magnificent proportions. Or, dedicating large blocks of export to the support of the postwar domestic economy in a dollar-pauperized world (which probably greased the skids for the recent British loan more than moral or ethical considerations), with the sacrosanctity of import tariff walls inviolate. Or, to mount a more moral plane, first introducing the atomic bomb to total warfare, then advocating its outlawry as a war weapon. Or, digesting the world's only food surplus with excessive public smacking of the lips, with only the coldest of sympathy for distant misery and lagging fulfillment of marginal food commitments to a world clamant in its critical first winter of miserable starvation. Or, participating with Russia in the compounding of new international laws against the starting of war, while the world throbs to the preliminary power plays of both for the future conflict that is so casually predicted with disconcerting certainty. Or, short-lived fury in the planned ruin, devastation and Morgenthau-type pastoralization of Germany and Japan with an unwillingness to contemplate a milder,

more rewarding long-term administration, meanwhile reducing military occupation to a relatively impotent cadre emotionally unprepared to face-up to the inevitable hate, misery and death that will lead only to festering sores of revenge. Or, the widespread uniform confusion of war aims, peace aims and superimposed aims, whereby a war purely to preserve national existence is somehow distorted into a war to correct each individual dischargee's private frustrations, or for desirable world improvements such as higher living standards at home and abroad, and universal democracy as championed by Henry Wallace.

SCHIZOPHRENIC conflicts such as these are traceable in part to a frenetic fear of joblessness, a blunting of sensitivity to moral verities, a feeling of weakness in the face of shattering scientific, political and economic forces, and excessive preoccupation with policies of least resistance and apparent immediate advantage along with a sort of realistic insouciance to the long term rewards of policies of greatest advantage. Considering the conservative temper of Congress and the shaky wartime self-discipline, even with the moral sanction of war and in an economy of relative plenty, there is little on which to base a monolithic transitional rationing and price structure.

Maybe in an industrial economy as widely scattered, heterogeneous and complex as in the United States, a quick break and complete *laissez faire* in the country converting itself, is the more rapid and efficient alternative. But it is an alternative fraught with some dangers and penalties, not the least of which is the current race with time to load shelves with a flood of civilian goods before people's savings, that have loomed so prominently in all postwar planning, shrink disastrously under the onset of inflation, over-pricing and black marketeering.

The wolf-cry of the runaway type of inflation has been so frequently shouted from the hustings that people work up little fright nowadays, perhaps in instinctive recognition of its impossibility within a state retaining any degree of public administration. But even a comparatively mild inflationary spiral can be pretty debilitating, and the extreme paucity of civilian goods with slow and steady diminution of the dollar's real value can hardly have escaped anyone's attention at year's end. The American production machine being what it is, the disgorging of consumer goods under a more benign tax could well be in such volume by late January or February as to halt the upward price increments. But that prices will drop much in the visible future seems less likely and that they should drop below war levels seems highly improbable.

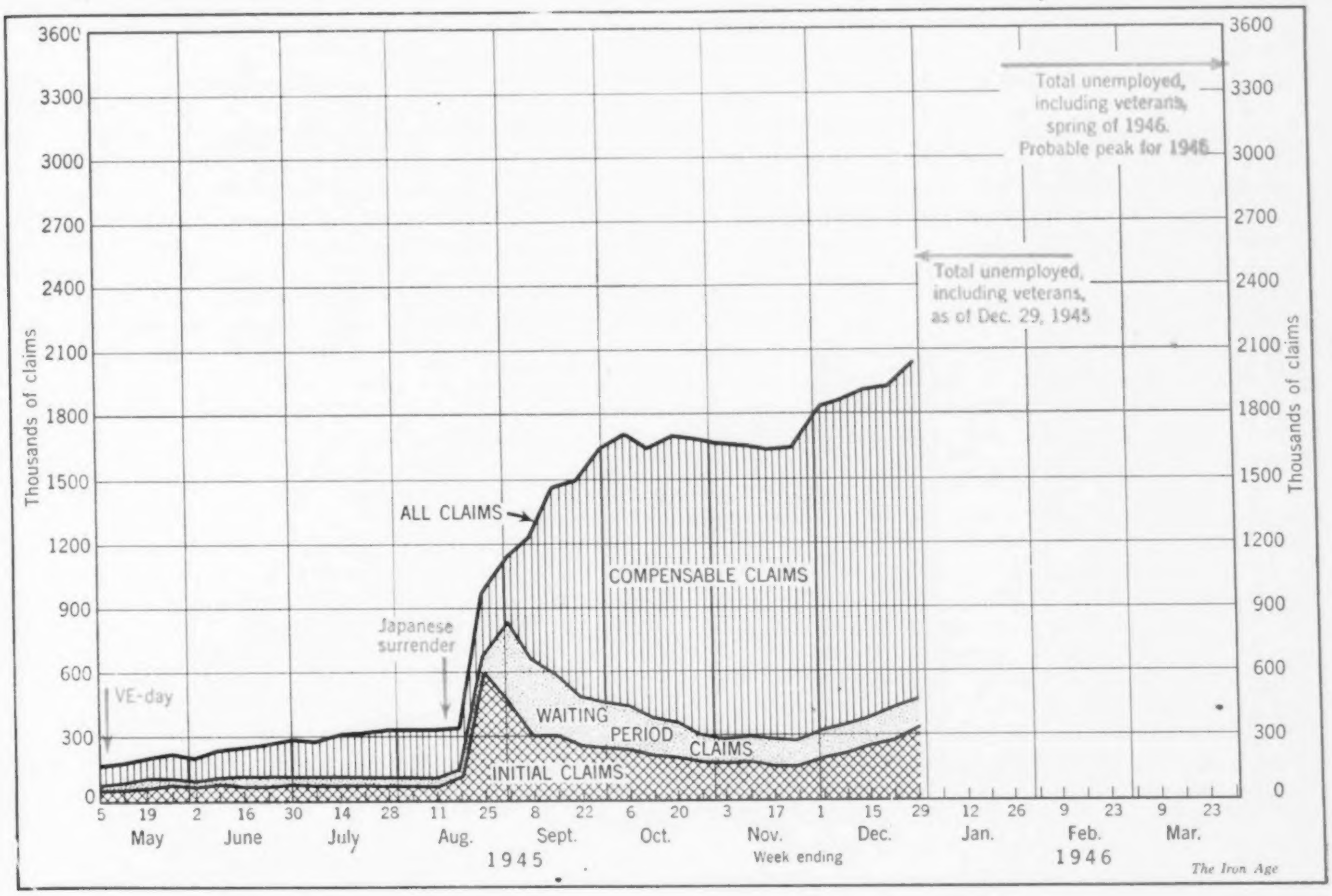
It would be presumptious to assume any reduction within the visible future for that largest single sponge for individual income, rent or house ownership. Nor, is the second largest absorber of income, food, likely to undergo downward revision, what with both political parties on record for present prices or higher for whatever quantities of products the farmers turn out. The conventional protectionist reaction to the political potency of the American farmer has led to commitments to support most commodities of any consequence for at least two years more by buying up any surpluses and, if desired, to dump the surpluses abroad at prices lower than cost or lower than domestic levels. Needless to say any dumping with Government support will hardly hasten the much-needed lowering of world trade barriers, and, once again, domestic policies run counter to the avowed foreign policy of the country. In fact, it is rather difficult to find anyone on either the political right or left who has even expressed desire to return to prewar price levels, and when William H. Davis, director of economic stabilization, said recently that postwar price levels must be maintained if the nation is to service its $275-$300 billion public debt, he seemed to have put into words the half-formulated conviction of many in industry and banking. But when, as a corollary, he insisted there be no increase in cost of living over the next 5 yr he appeared to be a man talking primarily to himself.

Thus, if the dollar is to buy just as much or even less than it does today, to most people the 40 pct rise in standard of material existence that is deemed necessary to the country's economy can come only through the acquisition of more dollars, which is formal language for a rise in wages. Both Republican and Democratic political leaders in the past several years have espoused increases to the present rather high basic straight-time rates, but only within the past several months have industry spokesmen rather belatedly emphasized that rising productivity is the only process by which higher real rates are made possible. So, while all the plans mapping out full employment in the visible future, whether by private industry alone or by the State alone or by the two superimposed, pay lip service to drastic increases in individual real purchasing power, the everyday attempts to implement these increases are already and will continue to try many a soul and prompt many a venomous debate.

The impasse between labor and management is not one so much of principle but rather one of degree. It pretty well boils down to how much increase in productivity has been or can be translated into real increases in standard of living. At war's start every economist and industrialist believed that only through giving up the butter could the guns of war be made. But ever since the early 1930's the normal 2 to 3 pct yearly increases in worker productivity had been for the most part frittered away in unemployment, and despite rises in wage rates were not translated into higher living standards. It was the sudden full exploitation of this sizable 10 to 12 yr increment in productivity that permitted arming the world simultaneously with some increase in overall living standards at home. But, during the war, what could have been a further increase in productivity was submerged by the inefficiences of marginal labor and careless manufacturing practices so typical of abnormal war bloat.

THE cryptology of PMH, or productivity per man hour, seems to have supplanted the more dramatic bloodletting of picket lines as the battling ground of current labor disputes. Certainly, a lot more is going to be heard of PMH over the next several years, and the varied measurements of PMH are just sufficiently erratic as to give answers conflicting enough to bewilder even the fictitious impartial observer. The management will accept arbitration involving the probing of profits, pricing and financial structures seems rather unlikely, for such invasion of management's most guarded prerogative would breach the inner wall of capitalistic enterprise itself, a wall already badly blooded.

One of the few really adult correlations of productivity with manhours, made by the *London Economist*, pointed out that of all factors involved the application of increased power per worker appears to



SUDDEN telescoping of production and military demobilization hit the unemployment compensation setup with far less impact than expected. And, general impression and propaganda notwithstanding, individual compensation claims average 5 weeks, with only 10 pct of all claims residual (cripples, oldsters, mental deficients, etc.) in character.

account for 80 pct or more of the increase in output per worker. "This somewhat startling result arises from a comparison of installed horsepower in manufacturing with the number of wage earners in manufacturing, as reported by the Bureau of the Census. Over the 40-yr period from 1899 to 1939, manufacturing output per manhour increased from an index of 100 to 309. In the same period installed horsepower per employed wage earner rose from an index of 100 to an index of 292. Using these terminal years, the increase in horsepower per wage earner was 95 pct of the gain in output per manhour, but the proportion varies for the different combinations of years; the 80 pct figure is an average result for eight different combinations of years.

"One partial verification of this thesis is the fact that throughout most of the 40-yr period the indices of total manufacturing output could be closely approximated by multiplying the index of installed horsepower by an index of hours per week per wage earner. This strongly suggests that the volume of manufacturing output is primarily a matter of the equipment available (always assuming it is appropriate to the task at hand) and the intensity of its use. The wartime implication is that the great rise in manufacturing output was due in part to the provision of additional equipment and the recruiting of additional workers to man it, but in much greater part to the use of the whole stock of machines on second and third shifts and more days per week, coupled with the considerable accomplishment of bringing sufficient materials to the hungry maws of the machines.

"How much of the wartime expansion in machinery and equipment will be usable (or used) in peacetime production no one knows. A reasonable guess appears to be about a 25 pct increase over and above the 1939 stock of equipment. If, as appears probable, the number of wage earners in manufacturing has also risen since 1939 by about 25 per cent in the next year or two, there will have been no net increase over 1939 in the horsepower available *per wage earner*, and the primary basis if incrased output per manhour will have been nullified. Here again the probabilities point to at best a minor net gain over the war period in output per manhour in manufacturing."

Labor's demands are such as to translate a decade of souped-up PMH increase into living standards. Industry claims of inability to meet any or the entire increase demanded without some price relief, faced as it is with higher unit costs which accompany below-capacity operations and with price competition in the offing. The state, currently bemused by lawmaking to impose solution by force, may be expected soon to follow the expediency of price relief to break the deadlock in some instances, whereas other deadlocks will be broken without price relief but with labor's demands scaled down.

Maybe rising costs will wipe out any translation whatsoever. Perhaps even the reverse will take place during the lifetime of today's adult, or until a revolutionary new technology such as atomic power takes up the slack. For, unless the world is soon organized for peace, and only the most impressionable optimist can detect such a trend, at least $5 billion of productivity each year will go into war goods. And, incomparably more harsh on living standards will be the

start within the next five years of tremendous drains on manpower to meet the threat of atomic warfare through such drastic industrial and human decentralization as to change the face of America.

ALL the vexing problems of wage adjustments may be expected soon to merge into demands for a guarantee of employment or an annual wage to satisfy a driving undercurrent fear of insecurity, as well as agitation for a work-week of 40 hr or less and passage of the Full Employment Bill, both of which reflect widespread basic distrust of the ability of private enterprise to provide saturation employment. And, growing interest in PMH may well revive dormant or discredited wage incentive plans.

Talk will undoubtedly outrun action on any enforced idleness, such as share-the-work through reduction of the work-week to 40 hr or 36 hr, or less. Although merely a poorly disguised form of unemployment, such fission of the work-week seems to have a hypnotic effect on much thinking both in and out of labor circles. Without strong-arm methods at the end of a bludgeon, a 36-hr week could hardly be other than self-defeating, what with workers acquiring supplementary part-time jobs in the very human and never-ending race to somehow match beer incomes to the champagne tastes so effectively whetted by clever advertising copy.

That industry will be involved in annual wage plans seems more likely. Of course the greatest limitations upon guarantee plans are cyclical fluctuations in business. Of the some 50-odd industrial guarantee plans in operation now, only eight are in capital goods (or durable consumers' goods) plants. Given a flexible work-week, which releases the employer from paying penalty overtime until 48 hr or 52 hr, it is possible that many firms not highly cyclical could give a substantial guarantee to workers of 2 yr service or more. The three highly publicized plans (Procter & Gamble, Hormel, Nunn-Bush) have such a safeguard, and other flexibilities such as liberal provisions for transferring workers from one department to another. In the steel industry, some plants of which already have as high as 25 pct of employees on salary, considerable effort has been expended in investigating annual wage possibilities, and among some of the steel-consuming industries there is lessening opposition to guaranteed work proposals.

As for wage incentives, it seems imperative that the future must necessarily reverse the long-time trend whereby individual workers perceive less and less connection between their individual efforts and the end-products on the shipping dock. It can be done, but it's going to require skilled and trustworthy administration by management and an about-face in labor's conventional rallying-cry that higher standards of living are the result of restricted output rather than decrease in unit costs. All too frequently, incentives have been dishonest, uncertain or needlessly complex. Any increase in efficiency should bring prompt monetary reward, a reward that can't be trimmed at will or cancelled by less efficient fellow workmen. Such intimate correlation of reward with physical output, with a good dab of profit sharing, would do more for the dual elevation of living standards and porfits than all the too clever plans being dragged across the front pages of newspapers.

Since full employment is what the country wants, full employment is what the protagonists of private enterprise say the country will get, although the selfsame protagonists frequently temper this assurance with the paradox of compensatory deficit spending. The assurance be what it may, and despite today's short supply of labor, there is a surprising amount of popular support for the Full Employment Bill. The name of the Bill itself hardly encourages opposition, for—like sin—who could be for unemployment? So, opponents have been forced to a defensive position of pecking away at the means rather than the end result. Even though the technicalities of implementing a full-employment program are patently of stultifying complexity, any faltering in employment a year or so from now, when State spending retreats to modest levels, will line up powerful support behind the Bill.

Those advocates of full federal responsibility for saturation employment, who seem to unduly emphasize the creation of jobs rather than the increase of productivity, show no great concern for continued deficit spending, and generally work out a rather satisfying arrangement between the adventuring power of private enterprise and the financing and compulsive powers of the state. But, despite the assurance of mutual accord between planning, security and private enterprise, history elsewhere has inevitably had the latter two end up in the gutter with their throats cut after a rather messy fight, as the state is forced to take progressive steps into full control of production and distribution and interference with the consumers' freedom of choice.

THE fact that full employment responsibility may involve overwhelming increases to an already burdensome debt may not be much of a deterrent as recognition grows of a revolution that has taken place in finance over the past 20 yr. Just the degree of revolution may be visualized from the fact that 20 yr ago the value of money depended upon its convertibility into gold, whereas now the value of gold depends upon its convertibility into money. Or, the solemn assurances of the best financial brains in 1939 that unless the government debt be held to the $40 billion level, future borrowing must necessarily take place at an ascending rate of interest, 4 pct, then 6 pct, then progressively on up to credit collapse. But since that time some $140 billions has been added to the debt at a *progressively declining rate of interest.* It wasn't planned that way, and at best the war financing was envisioned at a steady rate of interest. Furthermore, the same phenomenon of declining interest rate was evidenced in all countries with strong central banks. With this development in mind, a few leaders in the inner circle of government finance are coming to the astounding conclusion that taxes are no longer necessary for federal revenue, although taxes would continue to be necessary for revenue purposes on the local level where no central bank is involved. Not that federal taxes would disappear entirely, for a not too burdensome program would be continued for the purpose of assuring a degree of integrity to the currency. A lot more is going to be heard of this philosophy, a philosophy which will appear increasingly attractive to many as heavy expenditures continue to be forced onto the Federal Government, for a large military, for occupation forces, for widespread atomic and military research, for placating innumerable pressure groups, for financing the large-scale relocation of things and people which seems unavoidable. Marching along with such a revenue philosophy would in all probability be a slow-steady inflation, or debasement of currency, in essence a tax on savings or accumulations of wealth, which meshes with still another and older philosophy that only by penalizing wealth accumulations can a complex, industrial society be kept mobile.

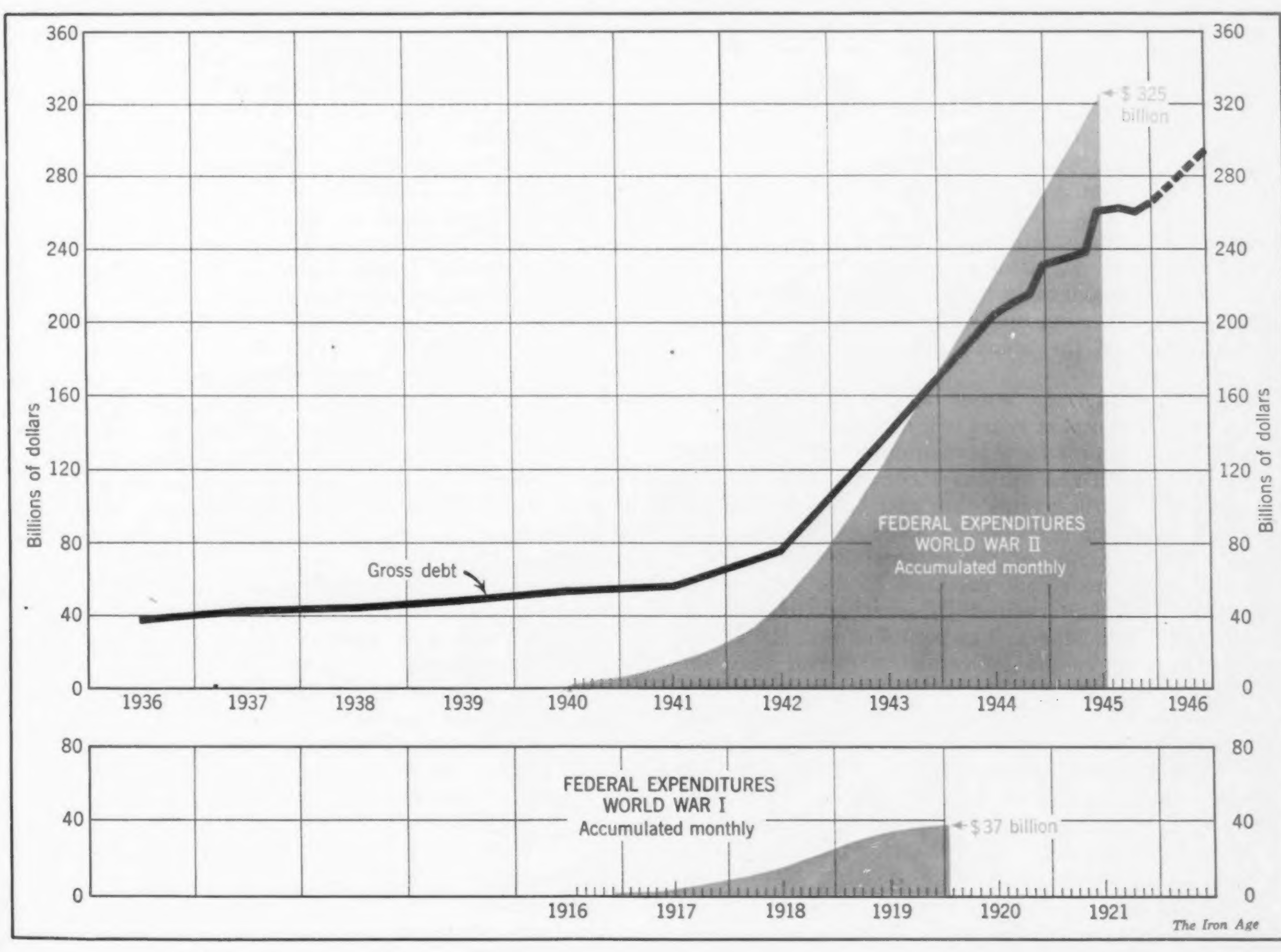
But, it all seems too easy, too easy indeed!

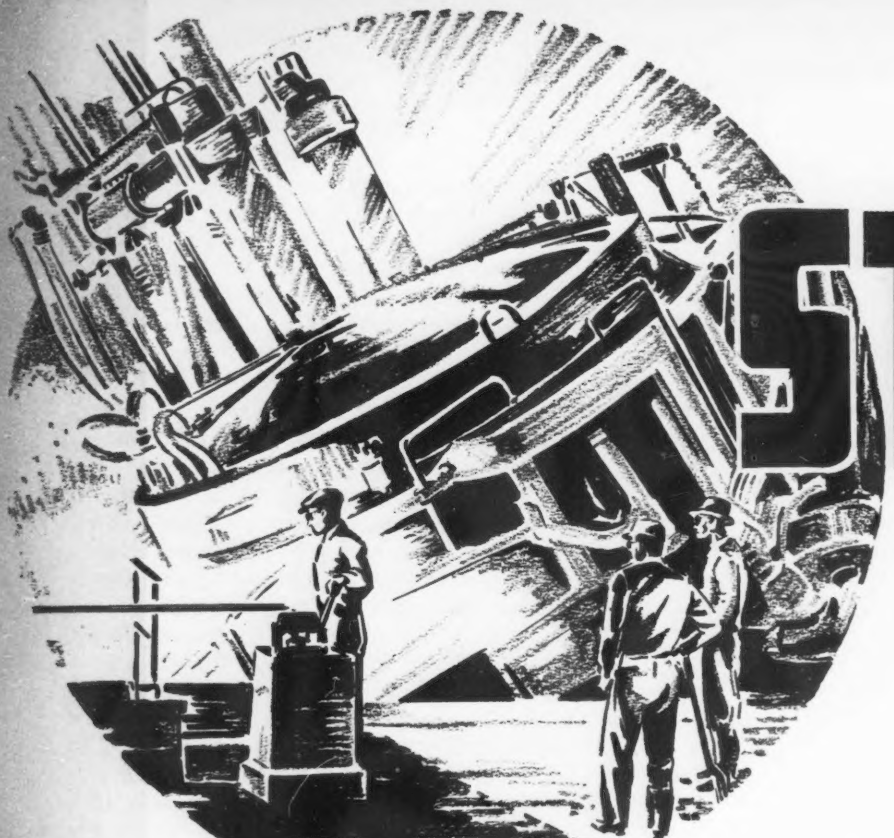
But while the financial experts tinker with this upheaval in finance, the whole world is somewhat more conscious of an impending physical revolution, the revolution of the atom. The very magnitude of this revolution has even radio commentators slightly bewildered, no mean accomplishment in itself. Whether it's fission for power purposes or fission for bombs which can quite conceivably destroy a large segment of mankind, many of the old ways of life and many of the conventional beliefs of society died at Hiroshima, and only remain to be buried when the coming naval tests, and shifts in balance of power, eat away the defensive armor of a generation satiated by prophecies of doom.

During the life of those who fought this war (assuming it's not sintered to an abrupt end) the power possibilities of atomic fission and the social changes to be wrought by defensive decentralization, can hardly do other than drastically wrench the entire social and economic structure of the country into a new pattern. No modern country can or will forego the competitive promise of atomic power, and since fission for power and fission for destruction are inseparable sides of the same coin, the world seems doomed to a future of precarious equilibrium of power. There's little comfort in the abject fright of those scientists most in position to know the possibilities of destructive fission, or the uneasiness of those political representatives most in position to appraise the curious retrograde reactionary one-party rule without the balance of public opinion, or the driving ideology and the burgeoning imperialism of Soviet Russia. While a World State as an alternative to destruction satisfies all logic and reason, it hardly seems likely that anything short of actual destruction can uproot the instinct of nationalistic integrity ingrained in each human since tribal days.

Widespread regrets on the discovery of atomic fission merely deny recognition of the dynamicism of scientific knowledge. Better the discovery be made at the tag end of one war than secretly devised in that indolent interim between wars. And, rationalization to excuse the use of the bomb could well be construed as the justification of an uneasy conscience, as no nation has or can ever realistically condone withholding a war weapon for moral reasons alone. But even the keenest ear detects no questioning of *how* the bomb was used. Neither Hiroshima nor Nagasaki was on the list of cities publicly designed for destruction by the Twentieth Air Force in late July. The atomic bomb could have been announced and then dropped on an isolated area, a few days later another on a less isolated area, and finally and after due warning a crowded city could have been the victim if further force were necessary. It's all a matter of fine moral delineation. The surprise destruction of a large city with such an unexpected revolutionary weapon was the decision of some one person or few persons, and there is an uneasy conviction which won't down that millions of people will live and die to rue that cavalier decision.

THE hasty slackening of fiscal screws on business and individuals reflects questionable will to face-up to a record Federal debt of $273 billion, for which interest charges equal total prewar Federal revenues. This same slack-will may welcome the new philosophy that taxes are no longer needed for revenue, what with $325 billion for the war raised on a declining rate of interest.





STEEL

STEEL company executives in 1946 would like to spend most of their time and energy on steel production and steel market competition, but the cards foretell a different story. Unfortunately for them one of their most insistent problems will continue to be labor relations. Faced with one of the biggest strikes in its history, the steel industry may well ponder over the outcome of its current labor controversy, because whatever settlement is made will reflect the trend of labor relations for some time to come.

Since 1936 the steel union has spent most of its time obtaining recognition and higher wage rates. It was assisted considerably by the Administration in its fight for organization and wage demands. Now part of that phase of the union's activity seems to be at an end.

Tactics and actions which Philip Murray's steel union has used in past years will no longer be the ones required now to produce a permanent organization and relationship with the various steel companies. That the steel union recognizes this fact is amply proved by the present approach to its wage demand as compared with the action of the automobile union.

Nowhere in the recent demands of the steel union has there been any request to scrutinize steel company books. Phil Murray has indicated that the prices charged by steel companies remain a matter between the companies and the OPA. It is expected that the more or less cordial relationship between the union's contact men and the steel companies industrial relations officers will not only continue in 1946, but will become almost matter of fact.

The overwhelming success which the union has achieved for its members over the past ten years could be ruined in a short time if union officials do not now realize that their future problems are identical to those faced by the steel industry. Now that wages are the highest in steel-industry history and slated to go even higher by as much as 15 to 20 pct, the steel union must of necessity shape its policy in such a way that the industry may benefit from union activity.

Unless the USWA initiates a program of closer cooperation with steel companies for the purpose of increasing productivity per employee as well as assisting management in its competitive market angles, it will eventually become nothing more than "another union." If it becomes this it will ultimately suffer a governmental strait jacket in the form of strict labor legislation.

On the other hand steel management has only recently awakened to the fact, long known by others, that a positive relationship with the public can only be enhanced by a cutting of red tape and managerial egotism. For years the steel union has beaten the industry to a stand-still in obtaining space in the national press on controversial matters. The result has been that the union has obtained a far wider dissemination of its views than has management.

It makes no difference whether or not the union facts are true. A denial or a counterproposal seldom obtains as much space and distribution as the initial blast. In recent weeks there has been evidence that the steel industry is coming off its high-horse and going directly to the public on matters which it considers all-important.

HOWEVER, the industry appears to have a little more road to follow before it reaches the enviable position of the union in getting its side of the story across. The year 1946 will mean as much to steel management with respect to future labor trends as it will to the steel union. Steel management would like to think that at least its own customers recognize the industry's side of the wage and price controversy.

Unfortunately the author has found on many occasions that the steel consumer does not share by any means the steel management viewpoint. If the industry has been so lax in that its own customers do not uniformly understand its problems and its position, then it would appear logical that the man on the street is even further away from the real facts.

Although production and distribution of steel during 1946 will constitute a major problem of steel firms, no company will be able to get away from the fact that its relationship with the public and its controversies with steel labor will loom just as important.

The inability of both union and management to show patience during trying times, as both sides at-

With unprecedented competitive and operational difficulties already at hand and labor and political problems on the horizon, steel management again faces a trying period which will demand the most of its ingenuity. Considerable attention will be devoted to production aspects of alloy steels in the openhearth as against the more conventional electric furnace.

tempt to divest themselves of governmental interference and control, will be as great a stumbling block in getting along with each other as any other one factor.

Some sources believe that once the present wage controversy is settled, the steel companies and the union can settle down and "enjoy" the production of steel sufficient to meet the nation's huge demand. This may be mere wishful thinking. The union now considers itself to be just as strong as the steel industry. On that basis it can be expected that the USWA will not rest, cannot rest and must continuously make fresh demands in order to keep the support of its large membership.

By TOM CAMPBELL
News and Markets Editor

It is not crystal gazing to predict that once the union has obtained a higher wage rate in the present controversy and once it has offered terms to prevent unauthorized strikes, it will launch a drive for some sort of a guaranteed annual wage. This particular demand is close to Phil Murray's heart and when the current drive to keep the pay envelope at the wartime level is successful or partly so, it is logical to suppose that the annual wage demand will become a rallying battlecry for the union.

SINCE it will take some time for such a thing as an annual wage for steel workers to be debated, negotiated, accepted or rejected, it will, however, serve to keep the union united in a common cause. Therefore, any steel official who looks for an end to his labor troubles is being overly naive.

Closely associated with the steel industry's labor problem is its price policy. Hemmed in by governmental red tape on one side and union demands on the other, the steel industry has unsuccessfully attempted to obtain a price increase. Washington officials, subjected to political pressure, dodged the whole price decision with the worn-out phrase, "We will look over your earnings for the fourth quarter." If any industry or company has been "looked over" on the question of price, it is certainly the steel industry.

If all the studies presented to the OPA on behalf of a price increase were laid end to end they would probably reach quite a distance across the country. The steel industry, now in a bad spot with respect to the return on many of its products, must again be subjected to a governmental scrutiny of its earnings to determine the validity of its demand for price relief.

It is true that the industry during the war did better pricewise than during the prewar period because it was able to obtain the full published price. Furthermore on shipments to areas not previously termed normal markets, the industry was allowed to charge full freight from the point of manufacture to the point of consumption. Also during the war the industry was able to charge and obtain many extras which were conveniently forgotten during the competitive prewar periods.

ADMITTING all this it does not necessarily follow that the industry has "made out well." It merely shows that if it had not been for these factors, the industry could hardly pay an average wage rate of more than \$1.15 an hr compared with 85¢ an hr a few years ago and 65¢ an hr back in 1936.

Contrary to some backroom talk, the industry is just as aware of the peril in too high prices as are economists or market experts. Nobody realizes more than the steel industry that its future markets are endangered by inroads of other metals and products, if the price of steel were to go too high. Steel men are not being lulled to sleep by the fact that the greatest proportion of steel produced cannot successfully be replaced by other materials because of its basic nature.

Unfortunately the return on practically all steel products which do not face strong competition from other materials is so low that their load must be carried by the profits of some of the more or less specialized items. However, the latter happen to constitute that small portion of steel output which could suffer the greatest loss from other competitive materials.

FACED on one hand by rising labor costs and on the other hand by the threat of competition from other products, steel officials at times must wonder why they chose such a vocation. With investment costs in the industry among the highest with respect to the sales price of its products, it may be that unless technological improvements and worker output multiply, the country's greatest industry in due time will become economically sterile.

One thing seems certain based upon views expressed within the steel industry—the caliber of steel management over the next few years must of necessity be so high that it takes second place to none. In years past the industry by force of circumstances or perhaps for other well-known reasons has allowed itself to be maneuvered into a position where it passed almost all of its gains onto its customers.

Such antiquated ideas are on their way out and the competition between steel companies will be more in-

tense over the next few years than it has ever been. The old idea of shipping steel into areas where the freight absorption was heavy just in order to be "represented" there, has been eliminated by many companies and will probably be dropped by the others. Furthermore the practice of predicating sales quotas on the basis of the company's percent of the industry's capacity is also becoming a thing of the past.

It now seems likely that all steel companies will be going out after as much business as they can obtain regardless of their relative position in the industry. While this will lead to the toughest type of competition, the strength of the steel labor union is such that the road to new and more numerous customers cannot be followed by a price cutting bypass.

In the "old days" a price cut was often followed by a wage cut, but for the past ten years this has been impossible; thereby accentuating the search for technological improvements as well as the refinement of quality and customer service.

Already on its way but still having some distance to go is the recent trend towards more basing points. Several months after the Supreme Court had ruled in effect that a single basing point for an item made at more than one location was illegal, the U. S. Steel Corp. began multiplying its basing points. Probably realizing that sooner or later it would be a target for the Federal Trade Commission in the latter's drive for an f.o.b. mill pricing system, the corporation completed studies on the feasibility of naming additional basing points.

The first action was taken on stainless steel last year when it went from a single basing point to a multiple basing point product. This general pattern of naming the place of manufacture of a product as a basing point was followed through on other steel items by U. S. Steel and by some other companies. The general program has by no means been completed.

It is expected that other steel companies will eventually increase their number of basing points with the ultimate result that the city at or near the point of manufacture will be made a basing point for the item made at that location.

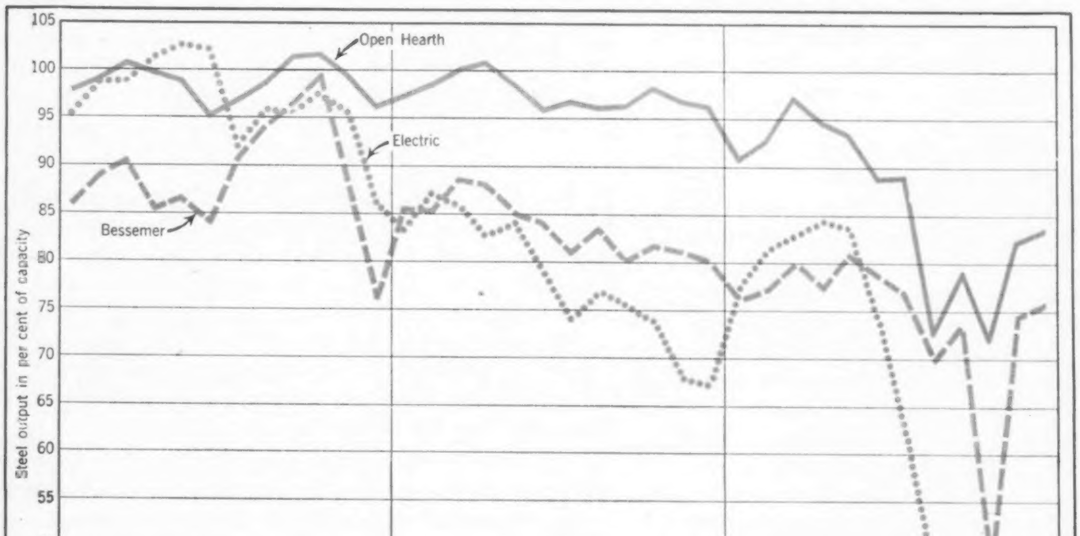
The long-term tendency of multiplying basing points may cause some drastic changes in steel output geographically. For instance in the case of the Pittsburgh district where competition with newly established eastern basing points will be keen, it may be that several steel companies will abandon some equipment there and replace it at a more strategic market location.

Rumors have been battered about that U. S. Steel Corp. will build an eastern steel plant. Complete plans have been made for such a plant with possibly a New Jersey location, but no decision to build has been made as yet. However, if further streamlining of the U. S. Steel Corp. policies runs into antiquated market or production methods, they will probably give way to more revolutionary actions.

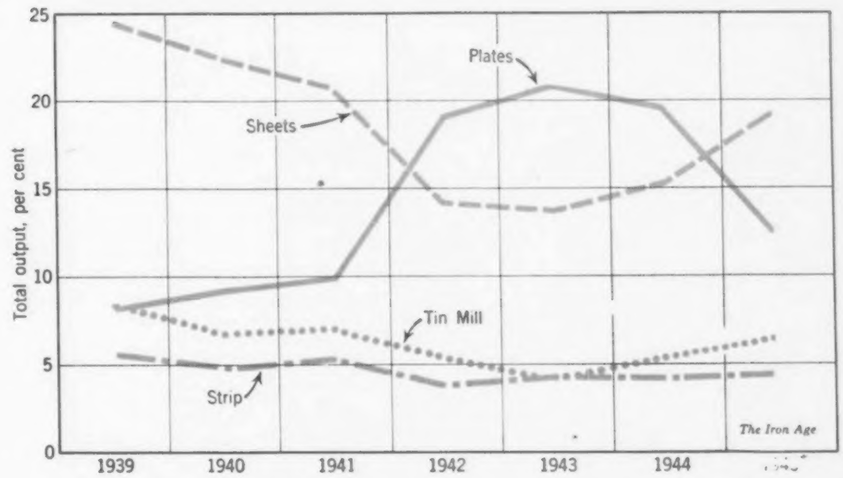
Regardless of how long it takes for the new basing point policy to unfold in the steel industry, it is a foregone conclusion that its effects on steel market practices will be greater than from any other single action since the abolition of Pittsburgh plus in 1924. It will mean less net steel prices to consumers and may ultimately result in further decentralization of manufacturing activities.

As a byproduct of the increase in the number of basing points, the search for technological improvements, the increase in wage rates and the keener competition in the steel industry will once and for all eliminate what is left of the so-called umbrella under which the largest company or the larger companies automatically contribute to the position of the small producers.

For years larger steel companies have sold huge quantities of semifinished steel to nonintegrated firms only to face competition from those companies in the sale of finished steel products. And it was not so many years ago that a subsidiary of one company sold semifinished material to an outside firm which in turn engaged in stiff competition with another division of the first steel company.



OPERATING steel rates over the past year have shown conclusively that the immense electric steel capacity built up during the war represented more than actual requirements. Starting to decline in 1944, electric steel operations in 1945 dropped sharply to almost 41 pct in December of this year. While this is an estimated figure the demand for electric steel will probably support this guess. Meanwhile openhearth output as in the past continued heavy with respect to other methods in 1945.



CANCELLATION of war contracts in 1945 resulted in a substantial drop in plate production. Most of this decline was immediately absorbed by a corresponding increase in the volume of sheet business. This chart shows the relative participation of the various flat-rolled products with respect to total steel shipments.

Now with larger steel mills requiring semifinished steel for their own finishing mills, there is a marked disposition to drastically slash the tonnage of semifinished steel being shipped to the small nonintegrated makers. For this reason it is expected that unless management of the smaller companies can, like a few units in that category, find their own markets in the form of specialties or special services, the going may be so rough as to cause fatalities.

In the past many of the nonintegrated steel companies had long-term contracts reflecting a price for semifinished steel below the so-called published price. There is no disposition on the part of the larger steel companies to renew such contracts. Without this differential it is hard to see how some of the smaller units can continue to sell sheet and strip as such. It will be necessary for them to broaden their fabricating facilities and possibly buy steel at the sheet and strip level rather than at the semifinished level.

The efforts of the smaller steel companies to obtain higher prices only scratches the surface of their problem. Proof of this lies in the fact that they cannot agree among themselves as to whether or not they should be freed from OPA price control. To charge higher prices than the so-called published quotations of the steel industry represents but a temporary advantage in a seller's market. The consensus among the nonintegrated mills and fabricators is that their price problems are irrevocably tied in with the price problems of the larger companies. Because of steel market selling practices, price increases must be on an industrywide basis.

Turning to steel production which in 1945 amounted to about 80,000,000 tons, a drop of more than 9,000,000 tons from 1944, output this year, if the steel strike is not prolonged, may run as high as 83,000,000 tons. The crux of this year's production will depend upon product mix, possibility of price relief and the abandonment or non-use of high-cost equipment.

No steel produced in 1946 will continue to make products on which the loss is too great nor will he utilize old equipment which is too costly to operate. It would be worth more to the company to operate at a lower rate making products which reflect a better return than to operate at a higher rate with products which must be "carried" by more profitable items.

The industry will not lack a demand for steel over the next few years at least. Backed-up requirements for peacetime production appear to be heavy enough to support a steel ingot rate of from 70 to 80 pct for the next two or three years. Some analysts in the steel industry are estimating four good operating years before any serious decline is noted.

The production of alloy steel in 1945 declined somewhat from wartime peaks. About 11 pct of total steel production in 1944 constituted alloy steel, whereas in 1943 it accounted for about 15 pct of total steel production. It is believed that while the participation of alloy steel will not decline to the prewar figure of 6 pct, it may drop to around 8 pct next year.

Openhearth operators in 1945 were rapidly regaining the alloy business which they lost to the electric furnaces during the wartime peaks. In 1945 openhearth furnaces supplied slightly more than 67 pct of the alloy steel as against 66 pct in 1944. During some months in 1944 the participation of the openhearths had been cut to as low as 64 pct.

Because of the drop in alloy steel output and the increased use of openhearths for making alloy steel, electric steel capacity during 1945 was not utilized to anywhere near the extent experienced in 1943. In the third quarter of 1945 electric steel capacity operated at only 51 pct as against 76 pct in the third quarter

WHILE peacetime trends in pipe production will probably be reflected in 1946 statistics, output in 1945 continued to be influenced by wartime requirements. A negligible decrease in the participation of seamless tubes occurred, while buttweld pipe showed a slight indication of forthcoming building activity. It was noticeable that electricweld pipe was still able to hold its own during 1945, while lapweld pipe, with relation to total pipe production, declined slightly.

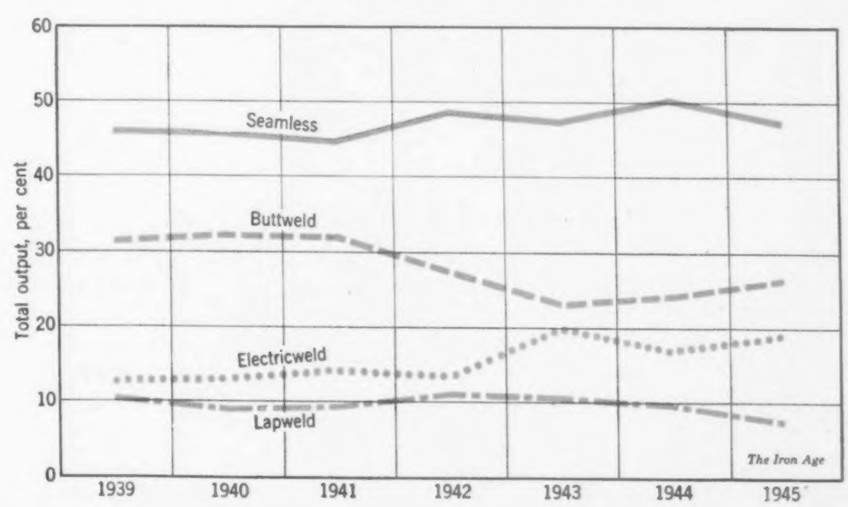


TABLE I

Production of Iron and Steel, by Product (1929, 1935-1945)

(In Net Tons and Pct of Total)

Year	Plates (Universal and Sheared)		Sheets and Strip		Shapes		Bars (Hot Rolled, Cold Finished, Tool Steel, Carbon and Alloy)		Pipe and Tubes, Skelp and Billets		Wire and Wire Products, Wire Rods		Tin, Terne and Black Plate		Rails, Wheels, Axles, Ties, Splice Plates		All Other	Total Production
	Tons	Pct of Total	Tons	Pct of Total	Tons	Pct of Total	Tons	Pct of Total	Tons	Pct of Total	Tons	Pct of Total	Tons	Pct of Total	Tons	Pct of Total	Tons	Net Tons
1929	5,624,798	12.2	8,688,726	18.8	5,351,382	11.6	8,314,316	18.1	5,487,339	11.9	3,510,538	7.6	2,418,274	5.2	4,389,938	9.5	2,212,435	45,997,746
1935	1,629,987	6.1	8,761,924	32.6	1,959,709	7.3	4,767,187	17.8	2,582,104	9.6	2,733,689	10.2	2,307,462	8.6	1,193,199	4.4	905,037	26,840,298
1936	2,829,950	7.5	11,447,319	30.2	3,215,346	8.6	6,822,492	18.0	4,225,272	11.2	3,357,626	8.9	2,945,232	7.8	2,053,851	5.4	930,456	37,857,544
1937	3,632,438	8.8	12,023,275	29.2	3,670,068	8.9	6,755,012	16.4	4,705,954	11.4	3,370,405	8.2	3,308,576	8.0	2,320,896	5.6	1,391,732	41,178,356
1938	1,919,835	8.1	6,948,749	29.5	2,082,685	8.8	3,484,923	14.8	2,882,471	12.2	2,361,630	10.0	2,191,905	9.3	993,684	4.2	703,069	23,568,591
1939	3,101,981	7.9	11,858,772	30.4	3,358,985	8.6	6,138,350	15.7	4,348,630	11.1	3,680,297	9.4	3,468,358	8.9	1,994,796	5.1	1,117,384	39,067,553
1940	4,323,408	8.9	13,783,700	28.4	4,232,346	8.7	7,885,261	16.4	5,029,966	10.5	4,351,848	9.1	3,625,551	7.5	2,399,494	5.0	3,028,795	48,660,369
1941	6,199,575	9.9	16,142,759	25.9	5,724,836	9.2	10,978,698	17.6	6,583,495	10.6	5,268,423	8.5	4,818,922	7.7	2,961,999	4.8	3,646,080	62,324,187
1942	11,799,600	18.8	11,248,392	18.1	5,969,009	9.6	11,939,982	19.2	5,939,915	9.5	4,632,017	7.4	3,520,059	5.7	3,090,294	5.0	4,306,646	62,445,914
1943	12,900,000	20.2	10,899,000	17.0	3,758,000	5.8	12,005,000	18.7	5,861,000	9.1	4,385,000	6.8	2,324,000	3.6	3,184,000	5.0	8,086,000	63,400,000
1944	12,457,356	19.5	12,258,903	19.2	3,977,790	6.2	11,108,920	17.4	6,293,709	9.9	4,521,991	7.1	3,262,044	5.1	3,985,464	6.2	5,979,947	63,846,121
1945	6,488,803	11.7	13,139,282	23.6	3,600,463	6.5	10,048,309	18.0	6,755,031	12.1	3,949,027	7.1	3,570,323	6.4	3,821,330	6.9	4,319,394	55,691,962

NOTE: Data for 1929, 1935-1944 from A.I.S.I.; 1945 figures are estimated by the author.

of 1944 and 86 pct in the first quarter of 1944.

The existence of such a large amount of unused capacity will serve to accentuate the postwar competition between openhearth alloy steel and electric alloy steel. There is no indication that openhearth makers will give up any business which they feel is theirs.

The distribution of steel by consuming industries, a yearly feature of THE IRON AGE, showed little change in 1945 from the 1944 pattern. Some increases in the construction and pressing, stamping and forming industries were due more to a better allocation of tonnages than to any basic change in the trend.

Total Steel Output

(Thousands of Net Tons)

Year	Alloy	Pct of Total	Carbon	Pct of Total	Total
1939	3,212	6.1	49,587	93.9	52,799
1940	4,966	7.4	62,017	92.6	66,983
1941	8,206	10.0	74,633	90.0	82,839
1942	11,526	13.4	74,506	88.6	86,032
1943	13,150	14.9	75,235	85.1	88,385
1944	10,633	11.9	79,009	88.1	89,642
1945	8,543	10.7	71,557	89.3	80,030

Alloy Steel Output

(Thousands of Net Tons)

Year	Open Hearth	Pct of Total	Electric	Pct of Total	Total
1939	2,459	76.7	749	23.3	3,208
1940	3,675	74.0	1,288	26.0	4,963
1941	5,740	70.1	2,462	30.0	8,202
1942	8,133	70.6	3,393	29.4	11,526
1943	9,217	70.1	3,933	29.9	13,150
1944	7,010	65.9	3,623	34.1	10,633
1945	5,740	67.2	2,803	32.8	8,543

Complete figures were available for 1945 on some ordnance items which were allocated to specific consuming industries instead of including them in the miscellaneous column. The increase in the construction industry was partly due to the inclusion of cantonments, barracks and basements, which in the year previous had been shown under miscellaneous because of censorship.

The first real statistics which will again indicate more normal trends of steel consumption by industries will be available in 1946. The effects of war business upon the 1945 figures were too great to allow in the last few months an indication of normal peacetime trends. Nevertheless data shown in the statistical tables reflect at least consumption by specific industries even though those industries were making products foreign to peacetime activities.

As a result of war contract cancellations the percentage of plate production to total finished steel output dropped from 19.5 pct in 1944 to about 13 pct in 1945. Sheet and strip output, which in 1944 was approximately 19 pct of total steel advanced to 23.6 pct in 1945. It is expected that sheet and strip production in 1946 will make considerable headway in regaining its prewar status increasing from 30 to 32 pct of total steel production.

Subject to possible revision later the total output of finished steel products in 1945 is estimated at 55,691,962 tons, compared with more than 63.5 million tons in 1944. Interruption in steel shipments due to to the coal strike in the last quarter of 1945 presents some difficulty in making the necessary year-end estimates.

Heavy repair programs and a slim safety margin of coke supplies caused by the coal strike severely affected output of the nation's blast furnaces in 1945. It is estimated that output in 1945, including ferroalloys, amounted to about 53,700,000 tons compared with 61,939,000 tons in 1944. Practically all districts operated considerably below capacity during the last months of the year.

One of the major reasons for a decline in pig iron output in 1945 was occasioned by the necessity to make extensive repairs on a great number of stacks. Practically all blast furnaces in the country had been pushed far beyond past performance because of wartime necessity.

Following the coal strike last October, many operation officials were unable to put furnaces back in blast after the end of the strike because, once having taken them off, repair programs were immediately

TABLE II

Steel Distribution by Consuming Industries (1939 to 1945)

(In Net Tons and Pct of Total)

	1939 Tons	1939 Pct	1940 Tons	1940 Pct	1941 Tons	1941 Pct	1942 Tons	1942 Pct	1943 Tons	1943 Pct	1944 Tons	1944 Pct	1945 Tons	1945 Pct
Agriculture	1,420,697	3.6	1,629,849	3.3	1,682,753	2.7	1,166,482	1.9	1,462,127	2.3	1,950,162	3.1	2,094,570	3.8
Aircraft	(a)		51,400	0.2	560,918	0.9 }	3,598,494	5.8 }	3,459,601	5.4 }	4,761,538	7.4 }	5,520,919	9.9 }
Automotive	5,906,358	15.1	7,964,923	16.4	9,847,222	15.8 }								
Construction	6,100,386	15.6	6,935,889	14.3	10,221,167	16.4	10,714,977	17.3	6,639,509	10.4	6,240,197	9.8	8,353,027	15.0
Containers	2,978,463	7.6	3,067,517	6.3	4,611,990	7.4	4,070,824	6.4	4,301,134	6.8	3,878,161	6.1	3,959,353	7.1
Furniture, furnishings	1,182,235	3.0	(b)		(b)		(b)		(b)		(b)		(b)	
Machinery, tools	1,460,000	3.7	2,339,365	4.8	3,365,506	5.4	2,852,077	4.6	3,275,323	5.2	3,270,156	5.1	4,739,454	8.5
Oil, gas, water, mining	1,841,599	4.7	1,900,286	3.9	2,929,237	4.7	1,585,969	2.5	1,903,285	3.0	2,464,068	3.9	3,359,374	6.0
Pressing, form., stamp	659,864	1.7	2,296,355	4.7	3,677,127	5.9	2,782,752	4.4	2,838,530	4.5	1,934,547	3.0	5,267,778	9.6
Railroads	3,250,022	8.3	4,019,219	8.3	5,983,122	9.6	4,400,444	7.1	5,172,196	8.1	6,134,249	9.6	2,670,079	4.8
Shipbuilding	517,771	1.3	999,858	2.1	2,929,237	4.7	10,369,766	16.6	13,318,107	21.0	12,011,301	18.8	3,374,403	6.1
Exports	2,817,482	7.2	8,719,805	17.9	6,045,446	9.7	10,800,000	17.3	8,850,116	14.0	5,107,690	8.0	3,683,749	6.6
All other	10,932,676	28.2	8,744,903	17.8	10,470,462	16.8	10,104,129	16.1	12,180,072	19.3	16,094,055	25.2	12,669,256	22.7
Total	39,067,553	100.0	48,660,369	100.0	62,324,187	100.0	62,445,914	100.0	63,400,000	100.0	63,846,124	100.0	55,691,962	100.0

NOTE: Distribution;
1939 to 1945 from The Iron Age, various government reports, and A.I.S.I. estimates, with jobber tonnage distributed and other alterations made by the author according to the technique devised by M. W. Worthing; 1945 data are estimates by the author.
(a) Negligible, or not available and included in All Other.
(b) Included in Pressing, Forming, Stamping.
(c) Included partly under Furniture and Furnishings and partly under All Other.

set up. Furthermore, with the definite probability of a steel strike in January some blast furnaces were still out of blast at the end of the year because superintendents felt it would be uneconomical to bring them in only to have to take them out again in case of a strike.

A substantial drop in pig iron production during the last half of 1945 created a shortage of hot metal and caused a greater reliance upon scrap for openhearth charges. Unfortunately, scrap supplies had already become tight and at the year's end were in one of the tightest positions than in any period during the war.

While it is expected that blast furnace output in 1946 will top 1945's record, such an expectation might be entirely wiped out if the steel strike occurs and if it is not settled promptly. The key to a greater steel production in 1946 rests entirely upon a balanced condition between hot metal supplies and the scrap flow.

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MORE or less unusual are statistics on steel consumption per capita over the past several years. Because of war demand per capita consumption of steel climbed to unprecedented heights. Obviously this situation will not prevail in the peacetime or reconversion period. Nevertheless pent-up demand, which may keep the steel industry busy for the next four years, will result in a per capita steel ingot production far surpassing the high point of 1929, but not above the wartime level of 1944.

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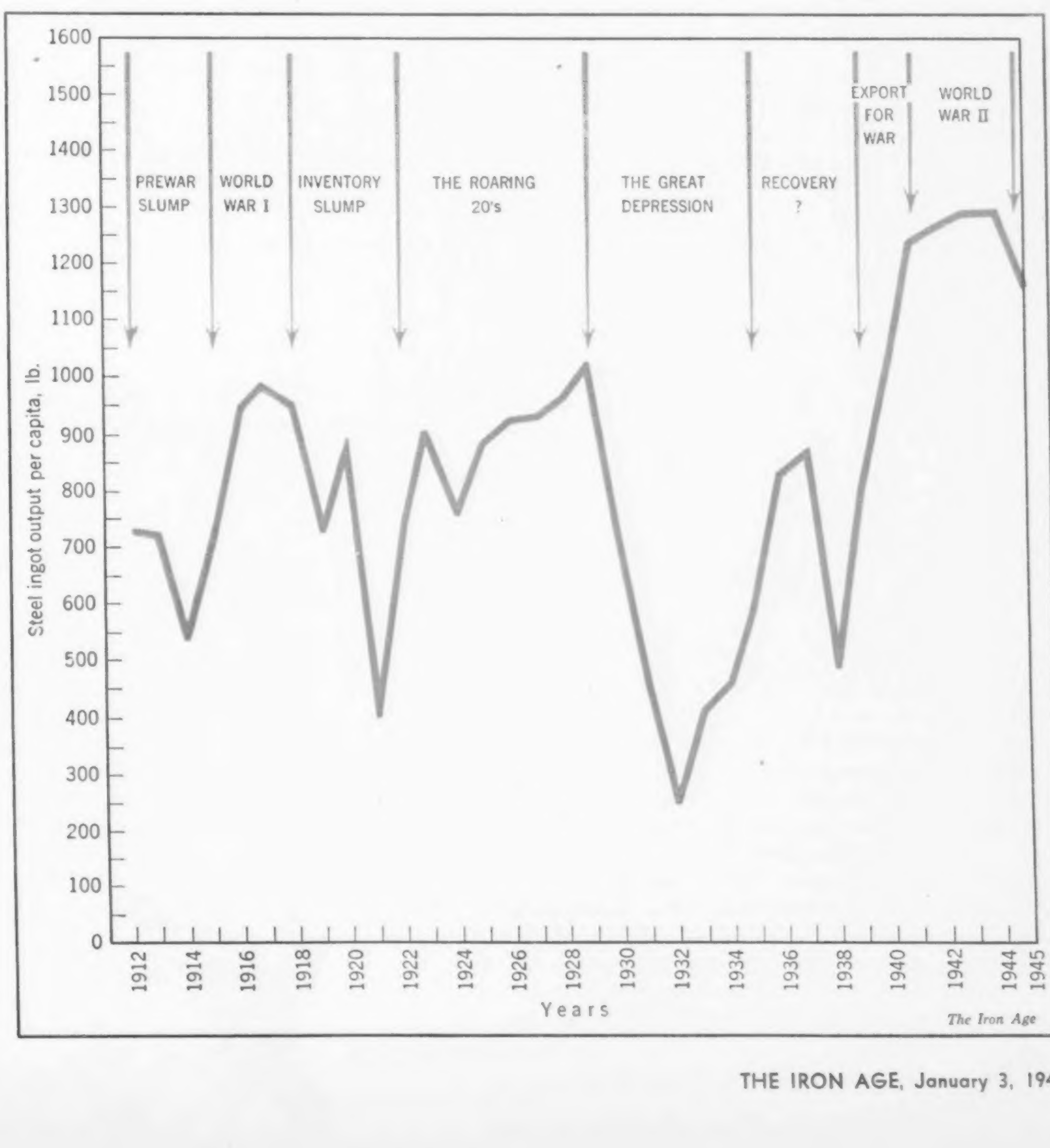


LABOR

By Lewis B. Schwellenbach
Secretary of Labor

ANYONE who reviews the labor picture during 1945 must be prepared to shift scenes rapidly. This is particularly true of any summary which centers upon events in the capital goods and consumer durable goods industries. From the Battle of the Bulge through VJ-Day, the manufacture of such goods was inseparably linked with the course of military events.

Those scenes before and after VJ-Day present marked contrasts in industrial activity, contrasts which can be measured and described with a fair degree of accuracy. They can be expressed statistically in terms of output, wage rates, hours worked, number of employees, and other specific data. Such figures are essential to any understanding of the labor scene in 1945.

But it would be a very sketchy and misleading picture that failed to include the less tangible changes that took place among the people of this nation as victory was achieved. I mean, of course, the mental attitudes, the hopes and fears, the ambitions and desires, that, taken together, create the social climate in which we live. Without some appraisal of this sort no amount of statistics will enhance our understanding of what took place on the labor front in 1945.

For much the same reason—to get a better perspective on that year—I want to look briefly at the prewar and war years which preceded it. A dynamic, evolving economy like ours pays little or no attention to dates on a calendar but it does feel the impact of events. Labor and management in January 1945, already had been conditioned by a whole series of events. They had experienced, or heard about, World War I and the inflation and deflation which followed. They were familiar with the so-called years of normalcy and prosperity that preceded the crash of 1929, and most of them remembered the depression years all too well.

Labor, organized and unorganized, saw the Federal Government take action through a series of laws designed to provide a measure of economic security for wage earners and their families and promote the practice of free collective bargaining. By and large this legislative program had the full support of workers throughout the country.

Management, for its part, was less receptive to these laws and the changing social climate which they brought. In some instances there was prolonged and open opposition on the part of employers and employer groups. But I think it is both fair and correct to say that experience gained under this social legislation has brought much wider acceptance from management. This is shown by the statements that came from various groups in business and industry and by the actual figures on the causes of employer-employee disputes during the period before Pearl Harbor.

There is one other piece of background that I would like to fill in here for it is one of the controlling factors in today's economic picture. It has colored the thinking of men and women who work for wages and those who direct them. I refer, of course, to the growing realization of our immense productive capacity and what it can mean in terms of higher living standards.

UNTIL VJ-Day our attention was fixed mainly on the mounting tide of war materials that we produced—ships, guns, tanks, planes—the figures were almost incredible and would have seemed far out of reach a few years ago. War production was so spectacular that it tended to obscure the very high level of civilian output which was achieved at the same time. But even under rationing, living standards were the highest in our history as farms and factories alike joined the battle of production. And we were able to reach these peaks while some 12 million young, able men and women were in the armed forces.

True, we drew into our working force perhaps seven million youngsters, older persons, and women who would not normally have been employed, but the fact remains that we were able to couple a $60 billion yearly job of war production with an output of civilian goods and services approximating $100 billion annually.

War brought into sharp focus the tremendous productive capacity of this country, carrying with it the implications of higher standards of living. The current labor-management controversies are part of the struggle for increased purchasing power to support record peacetime output. Mr. Schwellenbach, in reviewing conditions of labor, concludes that strife between labor and management can be resolved only by increased understanding of the requirements and true techniques of collective bargaining.

Not all of that huge war potential can be converted to useful peacetime purposes, but no fair minded person can doubt that our postwar capacity promises much higher living standards than we have ever known before. Record production, record distribution and consumption—to sustain this equation we shall need record purchasing power. Whether this balance is achieved through higher wages and salaries, lower prices, or a combination of both, it is essential to the smooth working of our mass production economy—since wages and salaries normally account for almost two-thirds of the nation's income payments.

There is nothing new or surprising in this, except the magnitude of the figures. Both labor and management are aware of this broad picture, though they may disagree sharply about its implications for specific industries and plants. Indeed, it is just here that the most far-reaching differences are centered. These differences will not be resolved by hasty or ill-considered action on the part of labor or management.

We can minimize the chance of such developments only if all groups, including government and the public, will examine and try to understand the basic facts of our economy. We will invite disaster if we become emotional and close our minds to the human side of industrial relations and the possibilities for better living that our dynamic society offers within the framework of our traditional freedoms.

In terms of employment the year 1945 began with our labor force numbering 62,867,000. By October 1945, the latest month for which figures are available, the overall picture had changed somewhat. Following VJ-Day, the total labor force declining by 3½ millions, unemployment increased to 1,500,000.

Table I gives a close-up of 1945 employment in some of the major durable goods groups which were largely engaged in war production. It is interesting to compare the decline in employment for this group—nearly 1,800,000—with the October 1945 figure for total unemployment mentioned above. Voluntary withdrawals from the labor force, combined with increasing employment in other fields—notably construction and trade—explain the seeming anomaly.

The trend of wages during 1945, as well as the average hours worked and average weekly earnings, are presented in table II.

BY comparison with prewar levels or even with January 1941, both average hourly earnings and weekly earnings show a very substantial increase. For all manufacturing, average hourly earnings rose 55.4 pct between January 1941, and July 1945; weekly earnings were up 70.5 pct. The increase in basic wage rates, of course, was much smaller than the increase in average hourly earnings.

But when we begin to look at the human angle and translate these figures into real wages and "spendable" income the picture assumes a truer perspective. By combining the figures with changes in the cost of living, with income and social security taxes and, finally, with deductions for war bond purchases, it is possible to make some real comparisons between early 1941 and July 1945, the last month before the end of the war. The results are quite surprising—especially to people who remember only the fact that average weekly earnings had risen by 70.5 pct during a four and one-half year period—for factory workers from an average $26.64 a week in January 1941, to $45.42 in July 1945.

If we assume that this average worker has agreed to put 10 pct of his pay into war bonds, the deduction for that is about $4.75 each week. If he is married and has two children, income and social security taxes take off almost another $2.00. A worker with no dependents would pay about $7.00 in taxes out of a $45.42 weekly wage.

Bond deductions were not compulsory but they did become quite general for American workers, and 10 pct was the most usual deduction. Of course, bonds represent savings but they do reduce the worker's take-

Table I

Employment in Metalworking Industries

Major Durable Goods Groups excluding Lumber, Furniture, and Stone, Clay and Glass	Number Employed		
	1945		Percentage Change Jan. 1945-Oct. 1945
	January	October	
	(In thousands)	(In thousands)	
Iron and steel and their products	1,657	1,195	−27.9
Electrical machinery	698	444	−36.4
Machinery, except electrical	1,163	887	−23.7
Transportation equipment	2,082	642	−69.2
Automobiles	682	461	−32.4
Nonferrous metals and their products	398	307	−22.9
Total	6,680	3,936	−41.1

home pay, his spendable earnings. In January 1941, most of the $26.64 gross earnings were take-home pay.

Thus in terms of ready money the married worker with two children who averaged $45.42 a week in July 1945, had $39 to spend, while the single worker had only about $33 left after bonds and taxes. Percentage-wise this meant in terms of spendable earnings an increase of about 48 over January 1941, for the married worker and about 31 pct in the case of a worker who had no dependents.

Now it is time to talk about the cost of living—as measured by the U. S. Bureau of Labor Statistics, of

Table II

Average Wages and Hours in Metalworking Industries

	Average Weekly Earnings		Average Weekly Hours		Average Hourly Earnings	
	January 1945	September 1945	January 1945	September 1945	January 1945	September 1945
					(cents)	(cents)
All Manufacturing	$47.50	$40.88	45.4	41.4	104.6	98.8
Durable Goods	53.54	43.89	46.8	40.9	114.4	107.3
Nondurable Goods	38.66	37.85	43.4	41.9	89.1	90.4
Industry Groups						
Iron and steel and their products	51.65	45.60	46.9	41.7	110.1	109.3
Blast furnaces, steel works, and rolling mills	55.04	48.35	46.2	41.0	119.1	117.9
Gray-iron and semi-steel castings	52.71	48.45	47.9	45.0	111.0	108.4
Malleable-iron castings	52.76	46.04	48.8	42.7	108.2	108.2
Steel castings	53.25	44.37	46.6	39.4	114.7	112.3
Cast-iron pipe and fittings	43.13	39.64	46.9	43.8	92.0	90.4
Tin cans and other tinware	41.67	40.31	45.5	44.1	91.6	91.7
Wirework	52.07	45.10	48.4	43.4	107.7	103.6
Cutlery and edge tools	45.69	40.77	46.6	43.7	97.5	94.0
Tools (except edge tools, machine tools, files, and saws)	47.67	41.99	47.8	43.2	99.8	97.3
Hardware	47.22	40.80	47.6	43.2	99.1	94.5
Plumbers' supplies	49.55	44.31	46.9	42.0	105.7	106.1
Stoves, oil burners, and heating equipment, n.e.c.	48.63	43.32	46.8	42.7	103.9	101.0
Steam and hot-water heating apparatus and steam fittings	50.10	45.25	47.7	43.1	105.0	104.5
Stamped and enameled ware and galvanizing	49.29	40.50	46.5	41.2	105.9	98.7
Fabricated structural and ornamental metal work	53.48	43.34	47.1	41.0	113.5	105.1
Metal doors, sash, frames, molding and trim	52.20	45.47	48.1	42.3	108.5	107.5
Bolts, nuts, washers, and rivets	49.89	40.17	46.9	39.3	106.5	101.9
Forgings, iron and steel	61.95	47.27	48.2	39.8	128.6	118.7
Screw machine products and wood screws	52.13	45.04	48.9	42.5	106.5	105.2
Steel barrels, kegs and drums	42.38	34.40	42.8	35.3	98.0	95.6
Firearms	57.67	46.16	45.4	40.9	127.1	112.9
Electrical machinery	49.64	41.25	46.5	40.3	106.9	102.3
Machinery, except electrical	55.92	48.04	48.7	42.9	114.9	111.9
Transportation equipment	62.61	48.38	48.0	38.5	130.4	125.8
Automobiles	59.42	44.81	45.2	36.5	131.4	122.8
Nonferrous metals and their products	50.92	44.46	47.2	42.6	107.9	104.4

Table III

Gross and Net Spendable Weekly Earnings, July, 1945, Compared With Earnings Required to Maintain Living Standards of January, 1941

	Worker supporting adult and 2 children						Worker with no dependents			
	Gross weekly earnings		Net spendable earnings after deduction of bonds and taxes		Earnings required to maintain January 1941 standards	Surplus (+) or deficit (−)	Net spendable earnings after deduction of bonds and taxes		Earnings required to maintain January 1941 standards	Surplus (+) or deficit (−)
	January 1941	July 1945	January 1941	July 1945			January 1941	July 1945		
All manufacturing	$26.64	$45.42	$26.37	$39.00	$33.85	$+5.15	$25.42	$33.23	$32.63	$+ .60
Machine tools	40.15	56.36	39.75	46.47	51.03	−4.56	37.58	40.65	48.24	−7.59
Electrical equipment	33.18	49.80	32.85	41.99	42.17	− .18	31.31	36.22	40.19	−3.97
Blast furnaces, steel works, and rolling mills	33.60	54.64	33.26	45.30	42.70	+2.60	31.69	39.51	40.68	−1.17
Shipbuilding and boatbuilding	37.69	64.56	37.31	52.14	47.90	+4.24	35.37	46.17	45.41	+ .76
Cotton textiles (cotton manufactures, except small wares)	15.60	29.38	15.44	25.64	19.82	+5.82	15.43	22.28	19.81	+2.47

the Department of Labor. The index of consumer prices had gone up about 28 pct between January 1941, and July 1945. This meant that workers generally over the country spent $32 or $33 to buy goods and services that would have cost only $25 or $26 in January 1941.

Goods and services that are priced in the BLS index include food, clothing, shelter and many other items that are part of most people's living expenses. Actually, our consumers price index does not fully reflect the effect of such factors as changes in quality and the availability of goods. Its use, therefore, somewhat understates the change in consumers' prices during the war period.

But to recapitulate: The married worker whose gross earnings were some $45.42 a week during 1945 found $39 in his pay envelope after tax and bond deductions. If he and his family wanted to live as well as they did in January 1941, he had to spend $33 or $34, instead of $26—compare his 1945 margin of $5 or $6 with the $19 extra that his *gross* weekly earnings *seem* to indicate.

The worker with no dependents, and earning $45.42 took home less than $35. If he tried to live as he did in January 1941, he had practically nothing in cash left over.

SO it is true that most factory workers here at home fared better in 1945 than in January 1941—at least in terms of savings and purchasing power. But the gain was not anything like as great as many people suppose.

Moreover, to get this extra spending power, factory workers averaged about 6 to 6½ extra hours on the job each week. For many workers these longer hours meant extra expenses which are not measured by the consumers price index, as it is now called. And, of course, the index does not pretend to measure the extra costs and expenses that workers had to meet in moving from one community to another, either to get higher paying jobs or to work in war industries.

These migrations were much more extensive than many of us realize. Between December 1941, and March 1945, more than 7½ million people moved from one state to another—an equal number moved between counties or cities. Men, women and young persons were involved in these mass migrations.

So far this discussion has dealt with "average" earnings of workers engaged in factories. When this overall figure is broken down into branches of industry some very interesting facts emerge. Bearing in mind that the same methods are used to calculate net spendable earnings for each branch of industry, table III presents data for a worker supporting a wife and two children and a worker with no dependents.

When we remember that the additional take-home pay which factory workers got in 1944 and 1945 required more hours of work in most cases, it is clear that these earnings were not out of line with the general income picture for the country as a whole. There can be, of course, no comparison with men and women in the armed forces who were called on for every kind of grueling service, including the supreme sacrifice. Many of them came from the ranks of labor, organized and unorganized.

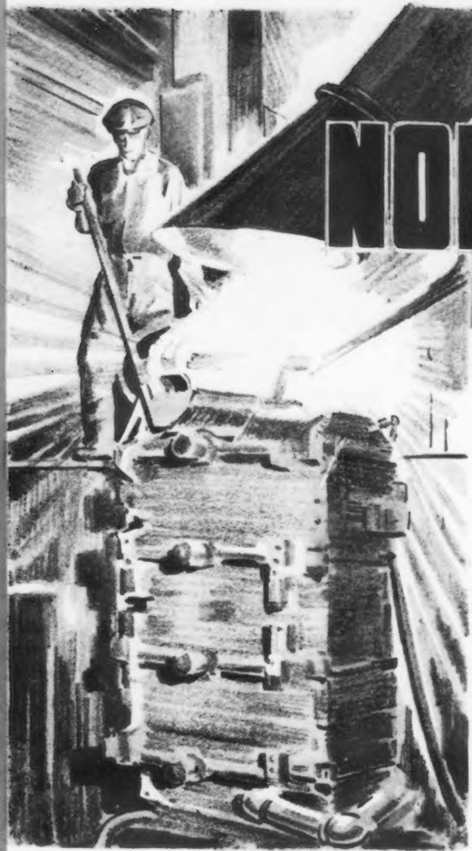
NO discussion of the wage structure in 1945 should overlook the results of inspections carried out under the provisions of the Fair Labor Standards Act and the Walsh-Healy Public Contracts Act. Both Acts provide minimum wage rates—generally 40¢ an hr for employees engaged in interstate commerce or in the production of goods for interstate commerce.

Offhand it might seem that 40¢ an hr was a purely academic figure bearing little relation to wartime wages. Yet some 6200 establishments were found in violation of the minimum wage provisions in the fiscal year ended June 30, 1945. This was 15 pct of all covered establishments inspected—the number of employees receiving less than 40¢ an hr exceeded 77,000; and 64,305 of these under-paid workers were in manufacturing industry. Out of 7041 inspections among establishments engaged in the manufacture of metals and metal products, 556 were found in violation of the minimum wage provisions and about 4500 employees were receiving less than the legal rate.

More than 22,000 covered establishments were in violation of either the minimum wage or overtime provisions or both, and restitution amounting to nearly $16 million was agreed to for some 442,000 workers in fiscal 1945. More than $10 million of this restitution was due factory workers. I should add that these "money" violations were not all deliberate by any means. Some were the result of misunderstanding about coverage for certain employees. But this record does indicate the continuing need for minimum wage standards even during a war "boom."

Perhaps the most arresting feature of the labor

(CONTINUED ON PAGE 288E)



NONFERROUS

By C. T. POST
Chicago District Editor

UNCLE SAM regarded as purely a *mariage de convenance* his affair with the Aluminum Co. of America during the war, when aluminum was needed desperately. Now the shooting has stopped, and the old boy is trying to sell into civilian production more than 50 pct of the country's aluminum capacity, it looks very much as though he faces the age-old problem of a man with his woman—he can't get along with her and he can't get along without her.

The tiff has been running, on and off, for 35 yr. Alcoa, queen of all she surveyed in the aluminum field, sang solo in the church choir of American industry, but gossips brought to the ears of the Department of Justice tales of scandalous goings-on at Sunday school picnics. The culmination of a long series of anti-trust actions against the company came March 12, 1945, when the Circuit Court of Appeals for the Second District, sitting as a court of last resort, held that the company as of 1940 had a monopoly in the production of aluminum ingot in violation of the Sherman Act.

The court tossed the ball to the government agency charged with disposal of surplus aluminum plants. The success of this agency in fostering sufficient competition through its disposal program, the court held, would be "at least one condition of the propriety of dissolution" of Alcoa. The Attorney General then put in a nice piece of downfield blocking in advising the Surplus Property Board last Sept. 6, that "as a general rule the disposal of any government-owned aluminum plant to Alcoa would be violative of the anti-trust laws, unless such disposal were accompanied by suitable divestiture of properties now owned by Alcoa to the extent necessary to create competition."

The Surplus Property Board (whose functions since have been turned over to a single administrator) needed no urging to treat Alcoa as a fallen woman. Those assigned to the actual writing of the Board's report had been closely associated with developing outlets for power generated at the giant Grand Coulee and Bonneville Dams in the Pacific Northwest. The government aluminum plants provide a logical outlet for big chunks of this power if they can be kept running. With the exception of its Vancouver, Wash., plant, Alcoa's interests appear to lie with cheaper power in the South.

The report, itself, is a remarkable document. In all its 131 pages there is only one short sentence which, in a negative manner, reflects any credit whatsoever

METALS

Uncle Sam ponders reducing diets to shed wartime fat in light-metals production facilities, but he's still hungry for the old-line base metals. Declining domestic mineral resources mean that he'll have to shop abroad to maintain this staple diet and keep shelves stocked for future emergencies.

upon Alcoa. The balance of the report kicks the company from cover to cover, eagerly grasping the invitation of the Attorney General to sterilize its potency in the aluminum reduction field.

FROM a statistical standpoint there is no denying that Alcoa dominates the country's aluminum ingot production capacity. The total primary aluminum capacity of the United States is 2,350,609,000 lb of which 989,857,000 is privately owned. Of the privately owned portion, Alcoa has 828,127,000 lb, and Reynolds Metals Co., a newcomer in 1941, 161,730,000 lb. Defense Plant Corp. (now RFC) holds a total capacity of 1,360,752,000 lb, of which, during the war, Alcoa was charged with operation of 1,320,564,000 lb and Olin Corp. 40,188,000 lb. The fact that the government entrusted Alcoa with operation of such an overwhelming proportion of one of its most vital wartime endeavors in itself suggests that the company could hardly be incompetent, unpatriotic, or totally without morals. From a technical standpoint it appears that during the period when it was allegedly misbehaving in its trade relations, Alcoa research, practically without help from the government, was responsible for most of the technical advancements in the use of the metal. Specifically, recently published information indicates that private research expenditures far out of proportion to sales which Alcoa made to the aircraft industry, were almost singlehandedly responsible for developing the aluminum alloys which made possible the overnight burgeoning of aircraft production at the outset of World War II. About two thirds of the wartime aluminum production was for aircraft.

The Surplus Property Board report indicates that through Alcoa's integration of all the various production stages from ore to fabricated products it has what the man in the street would accurately term "a sweet thing." But it also shows that Reynolds Metals Co., the David who went forth to do battle with this Goliath, has been unable, through lack of such integrated control, to make a profit on its aluminum ingot production. During the war only four of the government owned plants could produce primary aluminum at or below the 14¢ per lb market price for aluminum pig, the other five having costs as high as 16.732¢.

The production train of metallic aluminum production consists of mining bauxite ($Al_2O_3 3H_2O$), converting it to alumina (Al_2O_3) and reducing alumina to metallic aluminum. Most bauxite is imported, principally from Dutch Guiana, but lower grade ore is available in limited quantity from Arkansas deposits. As a wartime measure the government constructed the country's largest alumina plant, with an annual capacity of 778,000 short tons, close to the Arkansas deposits at Hurricane Creek. When the war ended the government had built up a bauxite stockpile there which, with new locally mined ore, could tide a new aluminum producer over for eight or ten years until foreign sources could be arranged. Another government alumina plant, with an annual capacity of 500,000 short tons, is located at Baton Rouge, La., to handle foreign ore. These two alumina plants constitute the key to disposal of the aluminum metal plants.

Reynolds Metals Co., Alcoa's principal challenger, has in its own plants capacity to produce 161,730,000 lb of *aluminum* a year, but capacity to produce only enough *alumina* to make 100,000,000 lb of aluminum. Therefore it is dependent for the balance upon Alcoa or the government plants, and naturally is particular about into whose hands the government plants fall. Neither Reynolds nor any other potential operator wants to take on any of the big aluminum reduction plants without assuring itself of a source of alumina other than Alcoa, its principal competitor. The Surplus Property Board proposal indicates a desire to hold the government reins on the alumina plants, particularly Hurricane Creek, by bringing in an independent producer, preferably one also buying an aluminum reduction plant. This independent would be bound to make available alumina at or near cost to other producers in order to permit competition with Alcoa. Alcoa shies at the "at or near cost" proposal, contending that the real yardstick would be Alcoa's alumina cost and that under such circumstances there would be no incentive for any private production of alumina.

WITH the exception of Alcoa's offer to purchase three metal plants and the Baton Rouge alumina plant, and to lease or buy Hurricane Creek, no outright purchase offers have come forward for any of the major alumina or reduction plants. Some interest was drummed up by a Surplus Property Board suggestion that the plants be leased on the wartime basis for an initial period of operation, with RFC to stand all losses and the profits to be shared 85 pct to the government and 15 pct to the operator. RFC would stand by to review and approve the price at which the metal would be sold, top salaries and extraordinary expenses. When Reynolds came forward with an offer to go this scheme one better, by assuming 15 pct of any losses during any year following the first year's operations, it was turned down flat by RFC. Since, Reynolds has leased the Hurricane Creek and the Jones Mills, Ark., reduction plant and has shown interest in the Baton Rouge alumina plant and either the Spokane, Wash., or Troutdale, Ore., reduction plants with no strings attached. This renewed interest undoubtedly was influenced by bills introduced into the Senate and House by which the RFC would be

CHILE'S copper mines, expanded to supply war demand, may produce a postwar surplus of 300,000 tons a year with resulting impact on Latin-American relations. One of the largest mines is that of the Chile Exploration Co., an Anaconda affiliate, at Antifogasta, where a 4 cu yd P&H armored electric shovel is shown loading cars.

authorized and directed to purchase surplus aluminum from government constructed plants up to 1,500,000,000 lb at the prevailing market price. So far RFC has not been able to squeeze any offer firm enough for it to grasp from American Smelting & Refining Co., Kaiser, Columbia Metals Corp., and Bohn Aluminum & Brass Corp., with all of whom it has had discussions.

The Surplus Property Board report sees little hope for disposing of any of the aluminum reduction plants other than Jones Mills, Troutdale and Spokane. Its reasoning lay in a breakdown of representative wartime costs showing costs of 11.354¢ per lb of aluminum at Spokane, 11.597¢ at Troutdale, 13.083¢ at Jones Mills, 13.882¢ at Los Angeles, 14.693¢ at River Bank, Calif., 15.379¢ at Tacoma, Wash., 15.945¢ at Maspeth, N. Y., 16.194¢ at Messena, N. Y., and 16.732¢ at Burlington, N. J. Badgered by statements that it could produce aluminum postwar at a mill cost of 7¢ to 8¢ per lb, Alcoa has expressed doubt that it will be able to produce cheap enough to "permit its sale at 10¢ per lb." Thus, the cost target for the government plants is going to be low.

The difference between being able to meet competition or failing may well lie in power costs. The Surplus Property Board has said, and Alcoa denied, that Alcoa is able to get much cheaper power for its plants than is available to other producers through government power projects, because it generates privately much of its own supply. The statement that power generated by government projects, part of whose cost was allocated to flood control and navigation, and which were intended as a yardstick to hold down private power rates, is more expensive than privately generated power has caused no little embarrassment in government circles. Changes in the TVA and Bonneville rates would not be possible without legislation changing the entire setup for their amortization. Reynolds declares that it would like power rates under one mill per kwhr on the basis that a raising or lowering of power costs by one mill per kwhr equals the raising or lowering of aluminum production costs by 1¢ per lb.

Behind much of the agitation for special leasing privileges and cheaper power is not so much the specter of Alcoa, but the shadow of the Aluminum Co. of Canada's plant on the Saguenay River in Quebec, the world's largest. The Quebec plant was designed for an ultimate capacity of 1,125,000,000 lb of aluminum annually and has actually produced at a rate of 700,000,000 lb per year. This compares to the largest U. S. plant, Alcoa's at Alcoa, Tenn., rated at 357,500,000 lb per year. Power for the Canadian giant is furnished by the Shipsaw hydroelectric power plant near the plant's site with a firm output greater than that of Boulder Dam, providing probably the lowest power cost in the industry. (Representatives have denied that it is as low as 0.5 mills per kwhr as charged by Reynolds when all costs are taken into account.) The Canadian plant has been a source of particular spite among potential Alcoa competitors because 39 pct of its war output was financed principally by advance payments on aluminum contracted for during the war by the United States and the British Empire. Most of the balance was paid for through loans from the U. S., United Kingdom and Australia. The United Kingdom loan carries a special abatement figure according to the percentage of capacity used, and the Canadian government has provided a special depreciation clause allowing the plants to be written off during the war. Clearly this plant could be a strong competitor in the U. S. market even with a 3¢ tariff. Although Aluminum Ltd., holding company of the Canadian firm, and Alcoa have been held by the courts to be separate entities, Alcoa's competitors also fear that common stock interests would cause the Canadian firm to dovetail Alcoa's interests in the American market. In 1944, about 200,000,000 lb was imported from Canada; in 1945, about 75,000,000 lb.

The argument as to whether United States government assistance should be given in placing its surplus plants in operation is held by some of the potential operators to be moot.

"I thought everybody understood the government was already in the aluminum business," M. M. Caskie, Reynolds vice president, told a congressional committee, having in mind that ore, plants and power resources are held by the government.

"If the government built them for war needs, why let them rot in peacetime?" is the substance of the argument.

Aside from the selfish interests involved, the dialectics of the opposing view are the same as for surplus plants of all types and run somewhat as follows:

(1) The sole prospect of utilizing any large portion of war created capacity is through development of additional markets. Whether such markets can be developed to any considerable extent by mere availability of metal is doubtful. In the past, markets in a free-enterprise economy have been created arbitrarily by lower price levels.

(2) Few surplus plants offer prospects of greatly reduced price levels on the basis of wartime or prospective postwar operating costs.

(3) These costs could be lowered and metal prices reduced by the government assuming some cost factors—possibly only that of risk, possibly by something more tangible, such as lower power rates or purchase of surplus metal.

(4) If the government assumes risk, it indirectly performs a function for which private capital in competing plants expects a reward and which must be reflected in these competitors' costs. If government provides cheaper power it is magnanimously bestowing a favor which the existing private plants did not enjoy in their development period and for which, in some form, they paid the costs of risk capital.

(5) In these ways, the government could promote new markets on a "loss leader" basis in order to dispose of its surplus plants. If it does, it is penalizing established firms which have come up the hard way, and is discouraging future risk capital for fear of future similar government excursions.

(6) If risk capital is discouraged, the return which the government receives through plant disposal may be small in comparison to the loss to the country's economy in the long term.

When all the persiflage is stripped away, probably the basic reason why new firms are chary of going into the aluminum business completely on their own hook lies in the matter of markets. Aluminum production and consumption in 1945, which still reflect some war demands, was only about a billion lb. The possibility of more than tripling this, which would be necessary to fully utilize the capacity which the Surplus Property Board regarded as "economical," is highly conjectural and involves increased consumption factors by the railroad and automobile industry which have not been proven feasible from a cost standpoint in competition with other metals.

Where Are the Markets?

John M. Olin, president of Olin Industries, Inc., which had operated the government reduction plant at Tacoma, took this view when he turned down the chance to buy it by stating, "The future of the commercial aluminum industry is too uncertain at this time to justify us to assume the enormous risks involved. Statistics now at hand show a large amount of both primary and secondary aluminum in inventory and present manufacturing facilities far beyond estimated postwar requirements. In the face of these two facts, it would be virtually impossible for a new commercial producer promptly to develop the necessary market for his product."

In the final analysis, the only justification for the government's making concessions in selling the plants would be to make things hot for Alcoa on the theory that Alcoa cannot adequately provide aluminum for the domestic economy at a fair price or secure national defense needs. This theory is negated by the belief that Alcoa's fangs have been drawn by the courts, with further neutralization possible if the Department of Justice gets its way and Alcoa is broken up into production "cells." Certainly, the mere holding of the plants by the government would constitute a Damoclean sword over Alcoa's head.

A Damoclean sword, or a vast resource, to whoever else enters the business, depending on how he views it, is surplus secondary aluminum. By June 1946, more than 40,000 combat planes, roughly 70 pct of whose weight is aluminum, are scheduled to become surplus, with more to come. Best available estimates indicate that from 1.5 to 2 billion lb of aluminum scrap will

UNDER direction of an Army sergeant, wrecked aircraft in India are cut up for shipment to the U. S. where they will become part of an estimated one billion tons of aircraft aluminum scrap hanging over the secondary market.

come out of the war, over one billion lb of it from obsolete and wrecked planes. That is equivalent to 2.5 to 3.3 yr consumption of aluminum scrap at the 1945 rate, assuming none were forthcoming from other sources. So far, the terms of selling junked planes have not been worked out to the satisfaction of the industry, and few buyers having stepped forward to take them at the $25 per ton floor price at which they are now tagged by RFC.

The planes are not as great a threat to the primary aluminum industry as they were to our enemies during wartime. Much of the aircraft scrap is of 24S alloy which, transformed into a remelt ingot, meets specifications principally as a base ingot for castings and extrusions. In 1944, about 34 pct of aluminum scrap consumption was by rolling mills, 62 pct by remelters, smelters and refineries, and 4 pct by foundries and other manufacturers. Thus some of the war scrap may be expected to be used by the primary producers rather than against them.

When the Surplus Property Administration recommended on disposal of surplus magnesium plants, it didn't even bother to trot out a whipping boy. As far as keeping more than six of them in magnesium production, it just threw up its hands. The government owns 13 plants accounting for about 90 pct of total rated magnesium production capacity, which amounts to 586,000,000 lb per year. Although magnesium output went from 6.7 million lb in 1939 to over 367.1 million lb in 1943, capacity operation never was reached.

TABLE I

Stockpile Reserves, Sept. 30, 1945*

Aluminum (primary), 385,140,355 lb
Aluminum (secondary), 6,223,128 lb
Antimony, 14,033 short tons
Bauxite ore, 2,792,435 long tons
Bismuth, 840,589 lb
Cadmium (pencils, balls and sticks), 1,338,914 lb
Chrome ores and concentrates, 928,318 long tons
Cobalt, 3,325,205 lb
Columbite, 33,991 lb
Copper, 543,843 short tons
Corundum, 1833 long tons
Electromanganese, 400,000 lb
Ferromanganese, 4429 long tons
Ferrovanadium, 1,805,568 lb
Fluorspar (metallurgical), 177,557 short tons
Graphite, 5980 short tons
Iridium, 3147 troy oz
Lead, 32,335 short tons
Magnesium (secondary), 2,215,566 lb
Manganese ore, 1,194,667 long dry tons
Mercury, 63,638 flasks
Molybdenite, 4,747,628 lb
Nickel, 34,644,021 lb
Osmium, 185 troy oz
Palladium, 71 troy oz
Platinum, 31,148 troy oz
Rhodium, 161 troy oz
Ruthenium, 39 troy oz
Silver, 7,413,094 troy oz
Tantalum-columbium slags, 340 short tons
Tantalite, 427,898 lb
Tin, 53,551 long tons
Tungsten, 22,181,997 lb
Vanadium, 1,805,568 lb
Zinc, 736,627 short tons
Zircon, 2581 short tons
Zirconium ore, 15,848 short tons

* Totals include strategic materials under jurisdiction of Office of Metals Reserve, Reconstruction Finance Corp., and do not include War, Navy and Treasury Dept. stockpiles.

Liberal estimates of postwar magnesium consumption—there is little agreement among estimators—run as high as 65,000,000 lb per year. This compares to 1945 production of about 58,000,000 lb.

Of the 12 companies who owned, or managed for the government, 16 plants during the peak of wartime demand, only Dow Chemical Co. is commercially producing magnesium today. Dow owns outright 36,000,000 lb of capacity at Midland, Mich., and Freeport, Tex. It holds a purchase option on adjoining DPC facilities at Freeport having 18,000,000-lb capacity, and another DPC plant at Velasco, Tex., with 72,000,000-lb capacity. During the war the seawater extraction process was perfected to such an extent that Dow will concentrate its principal postwar magnesium production at Freeport because of lower costs.

Principal potential competition to Dow lies in Henry J. Kaiser's privately owned Permanente Metals Corp. plant at Los Altos, Calif., about 75 miles south of San Francisco, which has a rated capacity of 24,000,000 lb per year. Currently not in commercial production, Kaiser's carbothermic process plant may be classified as not dead but sleeping. The $28,745,000 RFC loan on the plant was repaid in full a few weeks ago. Experiments are being carried on with a goal of reducing production costs 50 pct from a rumored 30¢ per lb, with a reported 33 pct reduction reported as already visualized. Permanente wartime costs are not necessarily representative of ultimate potentialities, because the plant was transferred to production of "goop" (incendiary bomb material).

Built to produce magnesium in a hurry with the least possible use of scarce materials, the government plants showed widely varying production costs. Lowest costs achieved, exclusive of interest and depreciation, at the electrolytic process plants ranged from 11.51¢ per lb at Velasco to 57.26¢ at Lake Charles, La. The ferrosilicon process plants showed costs ranging from 18.32¢ per lb at Luckey, Ohio, to 55.05¢ per lb at Dearborn, Mich.

The Surplus Property Administration recommends that six government owned plants be kept in at least partial magnesium production or standby condition for national defense requirements and that seven be taken out of magnesium production and adapted to other uses.

Interest has been shown in purchase or lease of eight of the 13 plants. As with aluminum, cheap power is a major factor in magnesium production, and the plants were located close to cheap power facilities. Much of the plant electrical equipment is suitable for chemical production, and it is for this use that most of the interest has been shown. Three chemical companies have leased portions of even the sprawling Basic Magnesium plant at Las Vegas, Nev., the country's largest, with a rated magnesium capacity of 112,000,000 lb annually.

Although in production capacity and investment magnesium is a giant, it still wears diapers from a marketing and research standpoint.

(CONTINUED ON PAGE 288C)

The IRON AGE

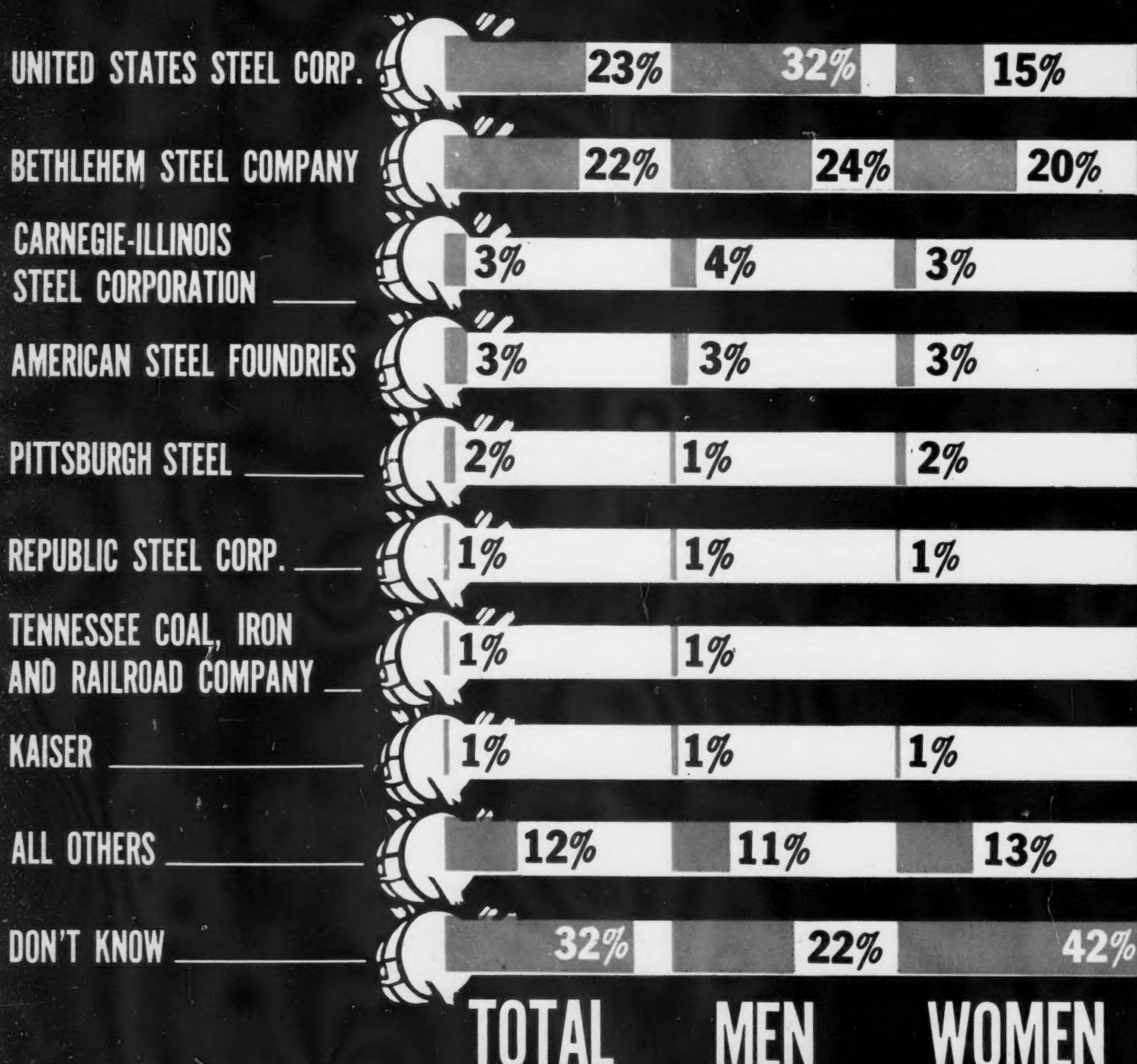
PRESENTS

What the Public thinks

A survey of public opinion on a number of questions of significance and interest, conducted for THE IRON AGE by Benson & Benson, Inc., Princeton, New Jersey. Poll findings are based on information gathered through personal interviews by experienced resident field reporters in a nationwide cross-section of people over 21 years of age.

Companies thought of first when steel industry is mentioned

Question 1 When the steel industry is mentioned, what company do you think of first?



COMMENT: While 23 pct of the respondents mentioned United States Steel Corp., followed by 22 pct who thought of Bethlehem Steel Co. first, no other steel company was mentioned by more than 3 pct of the respondents. It is interesting to note that women, for some reason, are more familiar with Bethlehem Steel Co. than with United States Steel Corp. At the same time, 32 pct of all respondents, including 42 pct of the women interviewed, were unable to name a single steel company.

Persons best known in the steel industry

Question 2 Which ONE person in the steel industry do you think of first?

	TOTAL	MEN	WOMEN
Carnegie, Andrew	13%	15%	11%
Schwab, Charles	5%	7%	4%
Kaiser, Henry	4%	5%	3%
Grace, Eugene	2%	2%	1%
Ford, Henry	1%		1%
Lewis, John L.	1%	1%	1%
Bessemer, Henry	1%	1%	1%
Stettinius, Edward	1%	2%	
Morgan, J. P.	1%	2%	
All Others	9%	12%	8%
Don't Know	62%	53%	70%

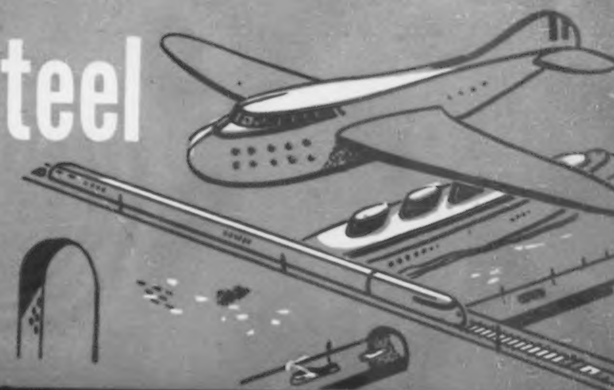
COMMENT: Although 13 pct of the respondents named the late Andrew Carnegie, almost three times the number who thought of Charles Schwab, his closest poll-rival, 62 pct of the respondents were unable to name a single person in the steel industry, a fact of some significance. Seventy pct of all women interviewed were unable to name a single figure in the steel industry; and surprisingly, 53 pct of the men interviewed were in the same position.

War profits of Steel Companies

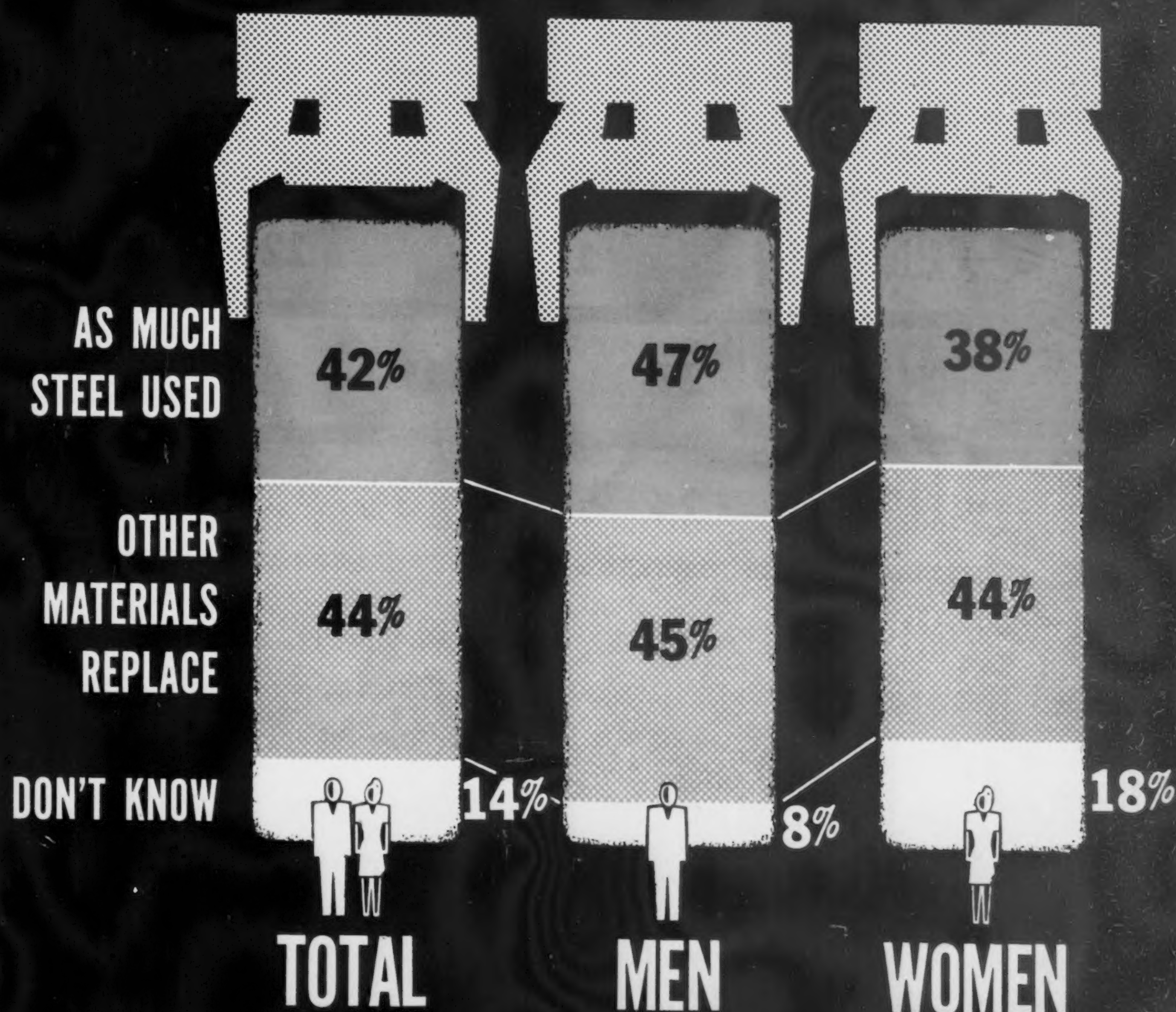
Question 3 Do you think the steel companies made more money than they should have out of the war, or do you think their profits were reasonable?

COMMENT: While 33 pct of the respondents claim that steel companies made more money than they should have out of the war, an equal number say their profits were reasonable and about the same number expressed no opinion. Sample reasons given by people who think the steel companies made more money than they should have included: "The CIO says so and it is in a better position to know"; "Steel profits always were too high"; and "All those big companies cheat and make money." Sample reasons given by people who think the steel companies made a reasonable profit included: "Taxes and high wages kept profits at a minimum"; "They weren't allowed to profiteer in this war"; and "Actually less than the stockholder were entitled to." That 33 pct of the respondents expressed no opinion at all while wage-increases vs profits is the focal point of one of the top domestic issues of the day is worthy of note.

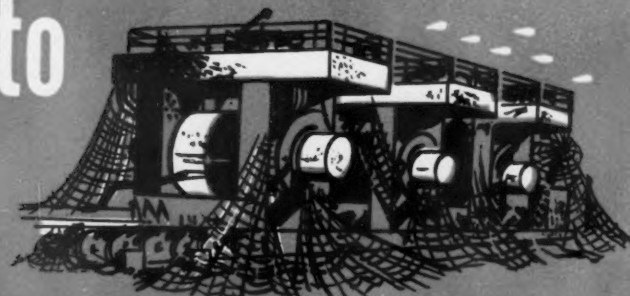
Anticipated use of steel in the future



Question 4 In the future, do you think as much steel will be used as now, or will other materials tend to replace steel?



Materials expected to replace steel



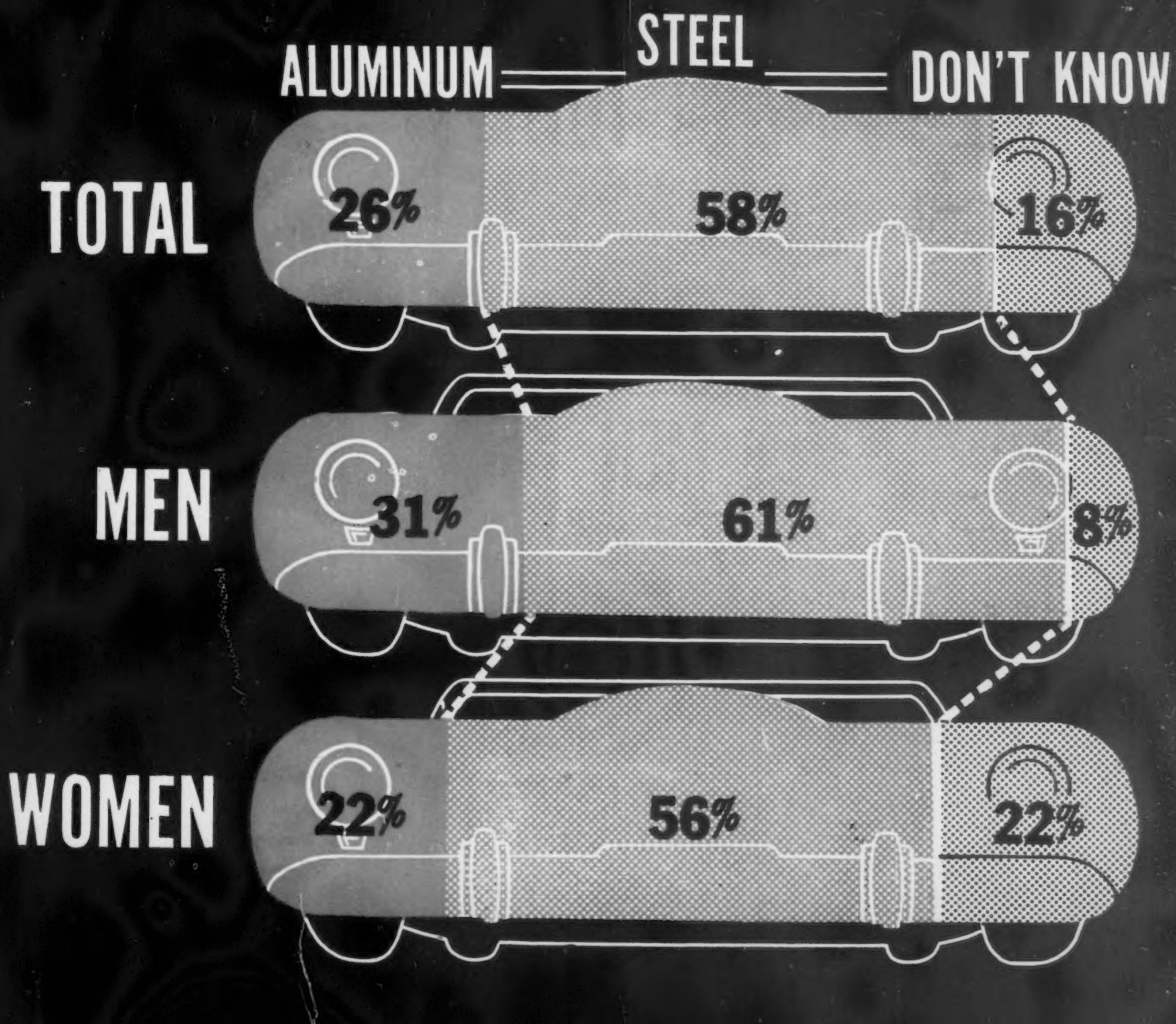
Question 5 What ONE material do you think will be used most often in place of steel?

	TOTAL	MEN	WOMEN
PLASTICS	19%	20%	18%
ALUMINUM	11%	12%	9%
GLASS	2%	1%	3%
MAGNESIUM	2%	3%	1%
ALL OTHERS	3%	4%	3%
DON'T KNOW	7%	5%	10%
TOTAL WHO THINK STEEL WILL BE REPLACED	44%	45%	44%

COMMENT: More than four out of ten people interviewed believe that in the future other materials will tend to replace steel. Plastics was mentioned by 19 pct of the respondents as the material which will be used most often in place of steel; aluminum, placing second, was mentioned by 11 pct.

Preferences in use of aluminum and steel in automobiles

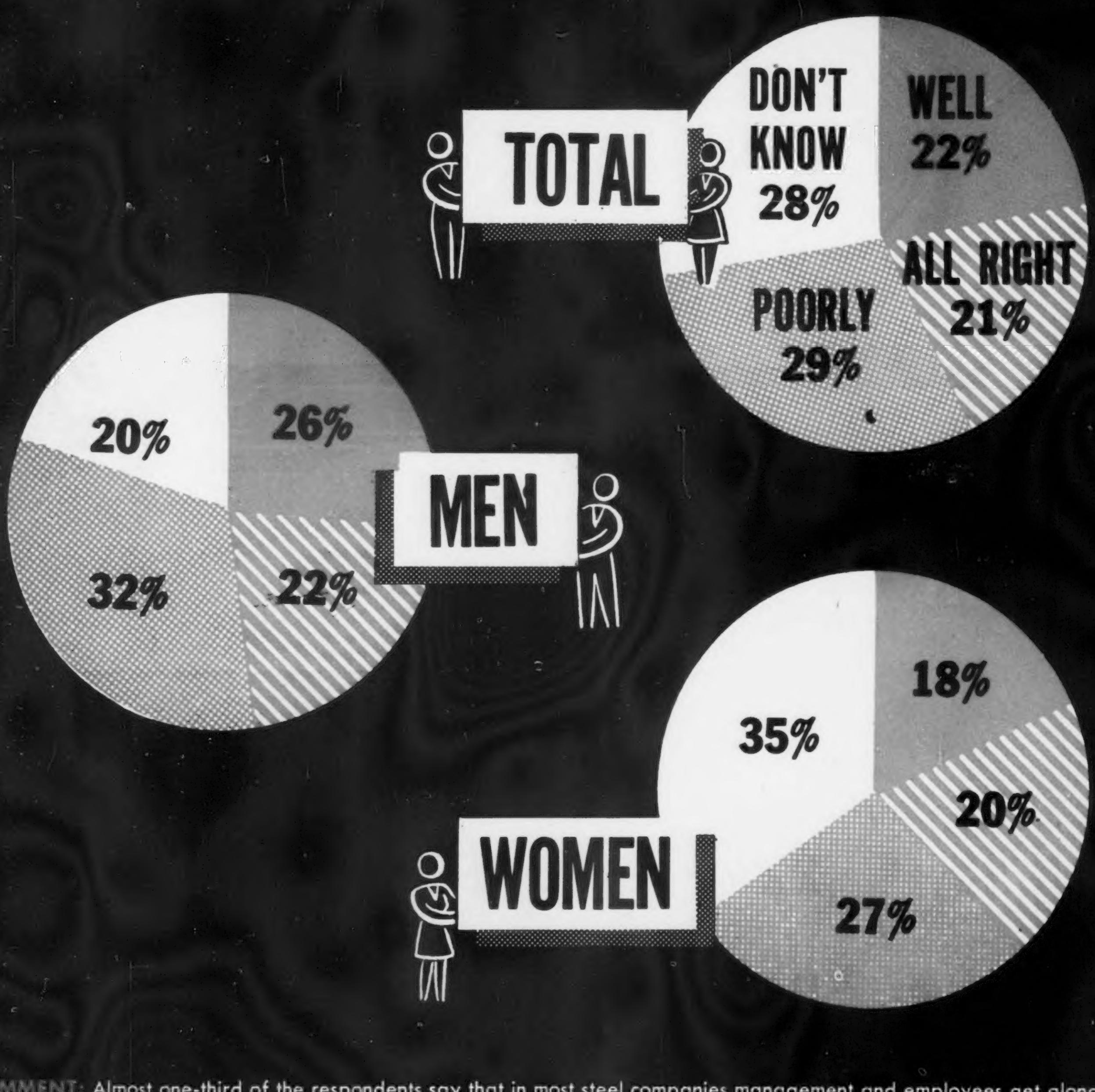
Question 6 The body and frame of an automobile can be made just as strong out of either aluminum or steel. If you were buying a brand new automobile would you prefer to have the body and frame made of aluminum or steel?



COMMENT: Almost six out of ten respondents still prefer the body and frame of their automobile made out of steel; one in four however, chose aluminum for this purpose. Sample reasons given by people who prefer aluminum include: "aluminum won't rust"; "it is lighter and easier for a woman to handle." Opposing reasons included: "steel is safer."

Labor relations in Steel Companies

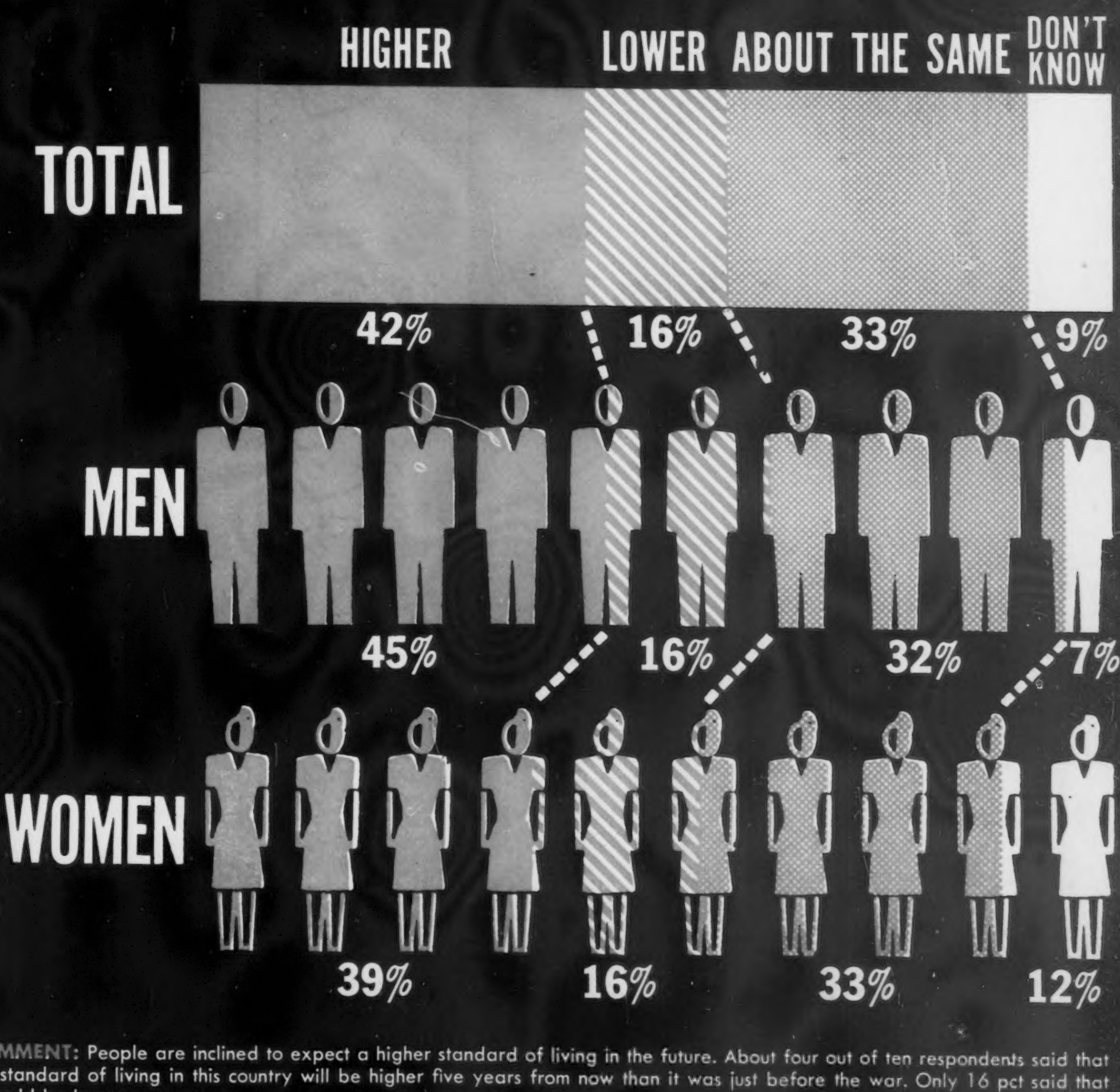
Question 7 Do you think that in most steel companies the management and employees get along well or poorly?



COMMENT: Almost one-third of the respondents say that in most steel companies management and employees get along poorly' while more than four out of every ten say they get along well or all right. Almost half of respondents who said that management and employees in steel companies get along poorly gave as their reason, "the evidence of strikes is very convincing." No other comment, on this or any other question, received so high a number of mentions.

Anticipated standard of living FIVE years from now

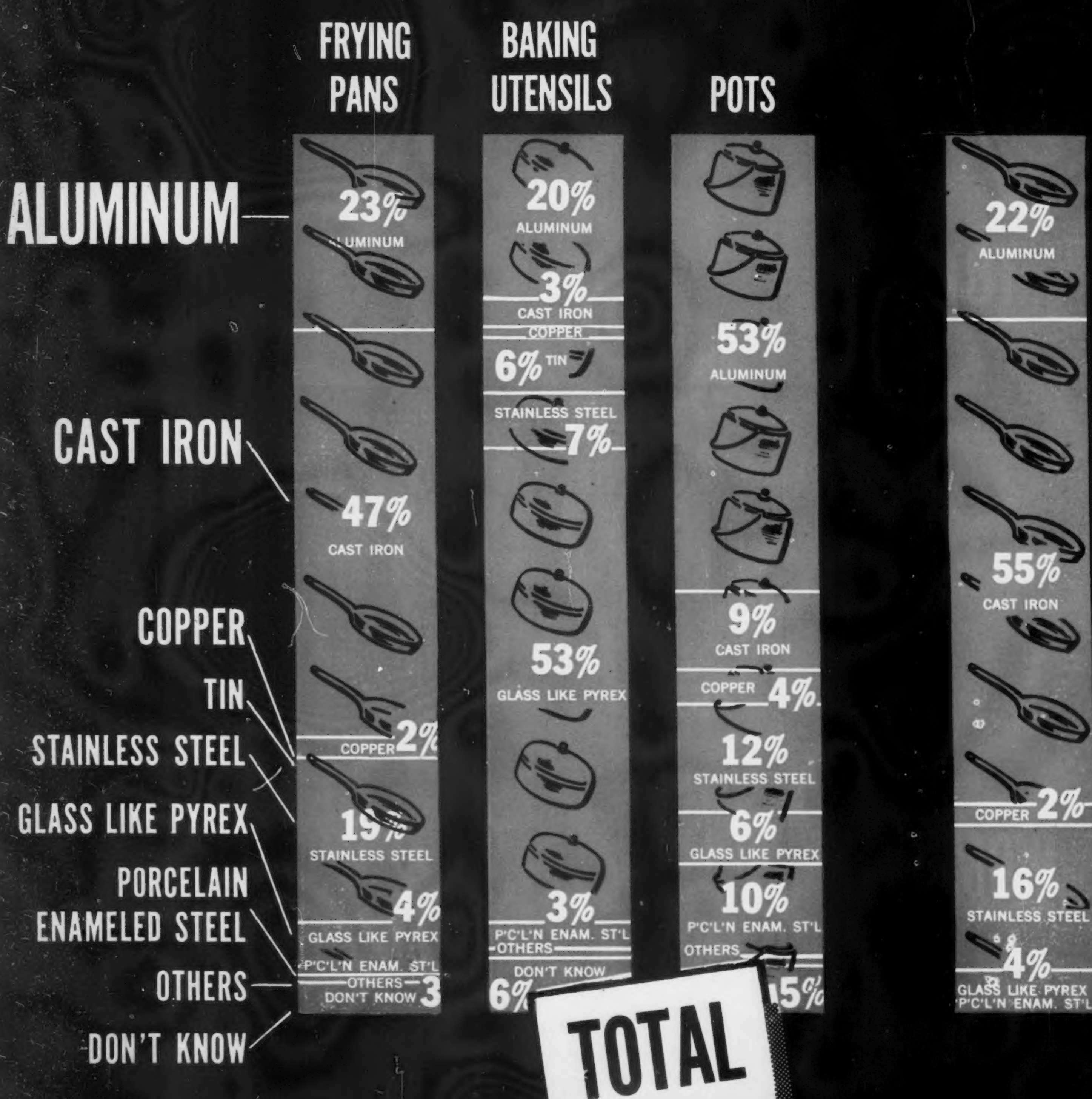
Question 8 Do you think that five years from now the standard of living in this country will be higher, about the same, or lower than it was just before we entered the war?



COMMENT: People are inclined to expect a higher standard of living in the future. About four out of ten respondents said that the standard of living in this country will be higher five years from now than it was just before the war. Only 16 pct said that it would be lower.

Best materials for frying pans,

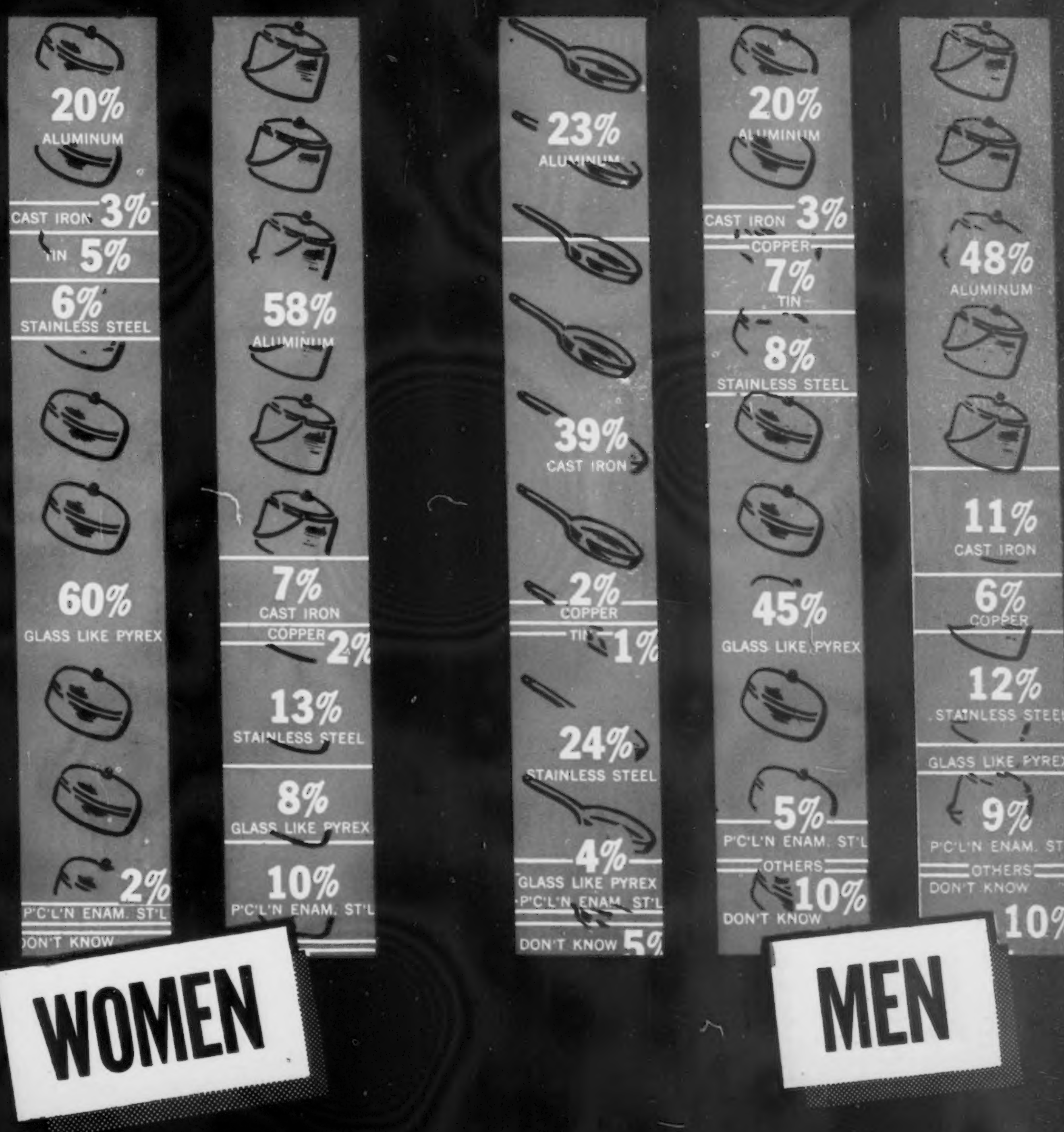
Question 9 Which ONE of the following materials do you think makes the best frying pans (baking utensils) (pots)?



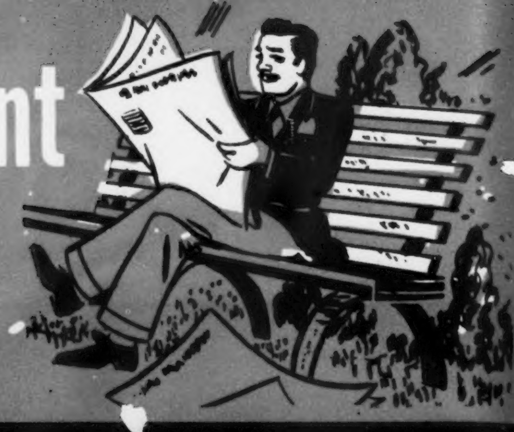
baking utensils and pots

COMMENT: Since it was felt that women's preferences in materials to be used in making frying pans, baking utensils and pots were more important than men, results refer only to women's choices.

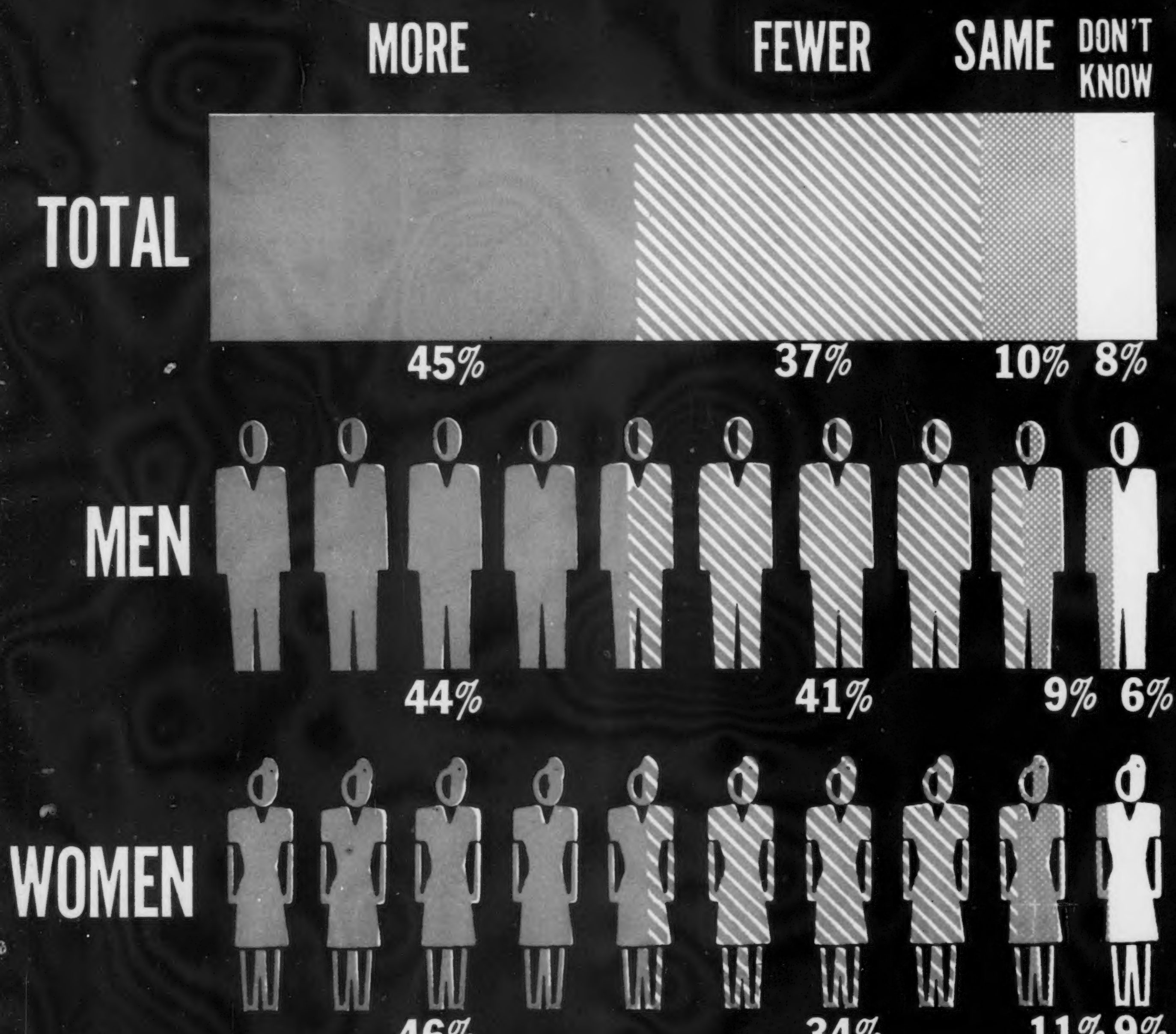
More than half of the women respondents prefer cast iron for frying pans; aluminum and steel were the second and third choices by 22 pct and 16 pct of the women, respectively. Women were overwhelmingly in favor of glass, like Pyrex, for baking utensils. Six out of ten chose glass, while two out of ten women selected aluminum. According to almost six out of every ten women, aluminum leads all other materials as best for pots. Stainless steel and porcelain enameled steel pots were next in order of preference, selected by 13 pct and 10 pct of the women, respectively.



Anticipated unemployment ONE year from now . . .



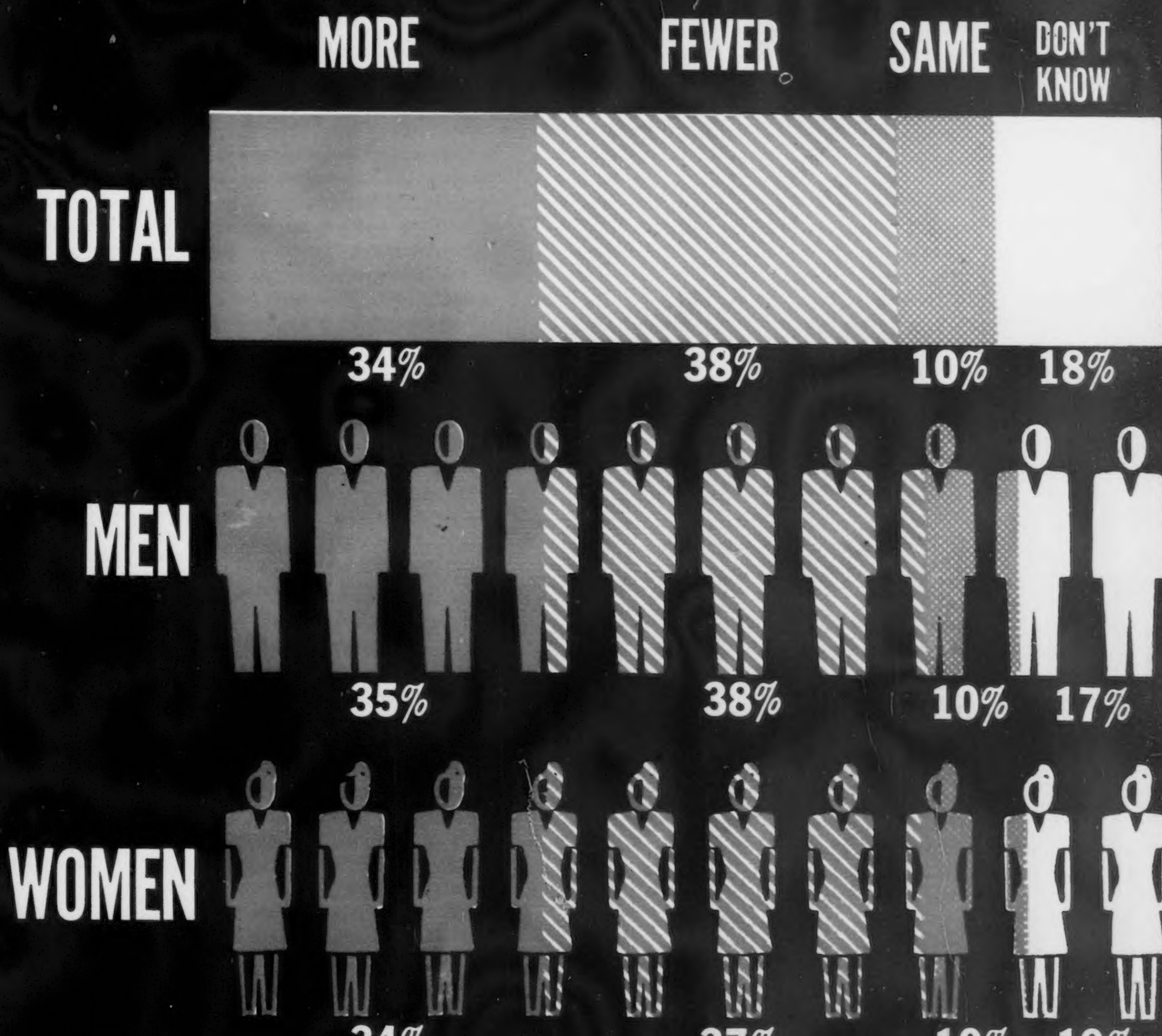
Question 10 Do you think there will be more or fewer people out of work one year from now than there were just before we entered the war?



COMMENT: The public's outlook on the amount of unemployment one year from now is more pessimistic than that five years from now (45 pct of the respondents believe that more people will be out of work one year from now than were unemployed just before the United States entered the war, while 34 pct think that situation will exist five years from now.)

Anticipated unemployment FIVE years from now

Question 11 Will there be more or fewer people out of work five years from now than there were just before we entered the war?



Sample comments of respondents who think more people will be out of work than just before we entered the war included: "new energy, new inventions will replace hand labor";"speed up of machines will make too much goods for demand."

CHARTS BY CHARTMAKERS, INC. N.Y.

MACHINE

By H. E. LINSLEY

Machine Tool Editor

THE final quarter of 1945 brought with it the long awaited, yet half-dreaded period of reconversion. Even since it became obvious that victory was within measurable distance, and particularly since the early part of 1945, there have been dire predictions made concerning the dark outlook for the machine tool industry in the postwar years. Remembering the careless dumping that took place immediately following the first world war, the industry would seem to have reason to feel alarmed, but, curiously enough, little if any perturbation was expressed by those within the industry itself, most of it having come, as usual, from outsiders least in a position to know the true facts.

The optimism expressed by the industry itself has been amply justified by the events of the past few months, although there is no question but that cancellations have been heavy. A major peak occurred in April when the total reached some \$22 million, and there were notable declines during the next three months, which seemed to indicate that the major part of the cancellations had already taken place. New orders continued strong during this period, in line with the policy of maintaining full production for the defeat of Japan. V-J day came much earlier than had been generally expected, and with it a flood of cancellations that mounted during the month of August to \$24¼ million, surpassing those of April. Thereafter, there was a very healthy decline. The current strike situation may result in further cancellations, but it is too early to judge of this, and the chances are that present orders will stand, although shipments may be delayed for some time.

Orders and Cancellations

In the frantic rush to "cancel everything," some curious mistakes were made, and it is reported that one establishment found itself suddenly deprived of power and light because some enthusiast had taken his orders too literally and had actually cancelled the contract with the electric power company. Be that as it may, there is no question but that there has been a substantial volume of reinstatements, which lends considerable strength to the often-expressed belief that many manufacturers during the past year or more have been placing orders with one eye very definitely on the possibility of using the new equipment in their postwar manufacturing program.

New orders are not proving too numerous, but there is a substantial backlog which should serve to maintain a reasonable level of employment for some time

TOOLS

Thus far the machine tool industry has maintained a stronger position than expected, and imaginative designs and aggressive sales plans augur well for the future. Surplus equipment, however, still moves too slowly, seriously threatening the market.

to come. Very few machine-tool builders are faced with any actual reconversion problems; rather they have the problem of readjusting themselves to peacetime manufacture at about their prewar norm. Many, of course, have excess floor space that was added to their plants, usually at RFC expense, during the days when lack of machine tools was the chief excuse for the delays in war production. Some of this may be absorbed to relieve overcrowded shops, but it appears that most of it will revert to RFC for disposal.

With a few exceptions, most producers seem disposed to stay within the bounds of their own particular lines, rather than branch out into fields in which they have had no experience merely to keep overexpanded plants operating at something like their wartime level. On the other hand, several are able to resume manufacture of items which were frozen during the war, and for which there is now a substantial and impatient market. Some builders are planning to set up new lines in their surplus space for the purpose of rebuilding and reconditioning machines. Some of these will undoubtedly be received from old customers who feel it is more economical to have existing equipment overhauled after its hard war service than to purchase new. Some, it is expected, will come from purchasers of surplus who are anxious to have their machines put into first class shape with the builder's guarantee, while others may be machines purchased by the builders themselves from surplus, for resale as rebuilt machines, provided satisfactory arrangements as to price can be worked out with RFC.

The whole picture, however, is by no means so rosy as might at first appear, since there are two major obstacles hindering a return to normal production. The first of these is labor. Despite the daily release of thousands of men from the armed forces, and in spite of the hundreds of thousands already receiving unemployment relief, there is a severe shortage of skilled manpower, and there is hardly a machine-tool builder who is not anxious to add anywhere from a dozen to two or three hundred men to his working force. Not all applicants, however, can be considered. During the war days, manufacturers put up with whatever kind of labor they could obtain, regardless of the inordinate amount of supervision required to maintain both quality and quantity.

Labor Situation

Now, with necessarily reduced forces, they are anxious to get back to the old footing and to employ craftsmen who can be relied upon to do their work with a minimum of supervision, and who do not need to be given detailed step-by-step instructions. Possessing an innate pride of workmanship, workers of this class are well aware of their worth, tend to be solid citizens of some standing in their communities, and are thus much less liable to be stampeded into unreasonable demands by irresponsible leaders.

The second obstacle is lack of castings, and this too reflects the labor situation, since it is becoming increasingly difficult to obtain foundry help. So severe is the casting shortage in some quarters that builders are beginning to pay considerably more attention to the possibility of using weldments, particularly for the major components such as beds and frames. This is particularly the case with builders of special machines where patterns would represent an unduly high proportion of the cost.

The wave of strikes and general labor unrest that is sweeping the country has not thus far engulfed the machine-tool industry. None of the major builders have had serious strikes, and indeed the record in this respect has been remarkable throughout the war years. Nevertheless, if the strike wave spreads it must inevitably affect machine tools either directly or indirectly, and unless conditions improve within a short time the shortage of materials will unquestionably cause a slowing or even a complete stoppage of production.

Shipments during the past year have maintained a fairly even rate, rising from a value of $36 million in January to a high of $40 million in June, and then falling off to nearly $29 million in October. New orders, on the other hand, have shown a steady decline, month by month, although October records show an upturn which can probably be attributed to the general unfreezing of civilian production.

Surplus Machine Tools

The chief fly in the ointment is, of course, surplus equipment, and unless this is disposed of within a reasonably short time it may deal the industry such a body blow as to cripple it for years to come. Surplus sales held thus far indicate a very lively interest on the part of buyers, with an average of three bidders for each item, and sales to the end of August show a total of $50 million. Under these circumstances, if the available surplus, which is estimated at 200,000 units, can be placed on the market while builders are still busy with their existing backlog of orders, there is reasonable hope for a moderate volume of business in replacement when current orders have been filled. If, however, the disposal of surplus is held up by official bumbling, and a flood of machines is released just when the pinch is beginning to be felt, things may indeed go badly.

with whom he has previously done considerable business, the buyer is apt to feel much more confidence. For this reason, some manufacturers have already indicated their willingness to cooperate with buyers, and to supply all possible information as to the age, condition, and suitability of the machine for their use. Nevertheless, it must be remembered that, despite this apparent altruism, backlog orders will not last forever, and in the meantime salesmen must live. Virtually all machine tools are sold on a commission basis, and every salesman is doing his utmost to push the sales of new machines by which he makes his living. So far as he is concerned, every surplus machine sold is money taken directly from his pocket, and it will take powerful arguments to convince him that in forwarding the sale of a surplus machine he is helping himself in the long run.

The present method of handling these sales is far from efficient, and all too frequently there may be a lapse of several weeks, or even months, between the time the would-be purchaser places his bid and the actual delivery of the machine. What is needed is some kind of cash-and-carry arrangement whereby the buyer can, if he desires, back up his own truck to the disposal point and carry off his purchase on the same day he pays for it. In this way he can get it set up in his own shop and start it turning out salable goods to meet the evergrowing demand.

The principal obstacle to quick turnover seems to be the lack of imagination on the part of those responsible for sales, combined with a total lack of understanding of the basic principles of selling machine tools. It is axiomatic that, except in cases where duplicates or very minor items are concerned, very few machine tools are bought in the manner of other commodities. Rather, they must be sold by experienced, production-wise sales engineers who have familiarized themselves with the customer's requirements and are in a position to advise him as to what particular type and model of machine will best fit in with his manufacturing methods and yield him the greatest return per dollar invested.

Purchasing Difficulties

The issuance of long lists of available machines will serve to indicate the general type of machine that is for sale, but it is not to be expected that, except in rare cases, anyone will purchase from these lists as from a mail-order catalog. A complete machine-tool specification usually requires three or four pages of type, plus several blueprints, and possibly a photograph or two. And even with this in his possession, a master mechanic generally prefers to see and touch the machine, or one something like it, and certainly in the case of a second-hand machine, is not prepared to trust someone else's judgment as to its physical condition. If, however, that someone else happens to be the original manufacturer, or a reputable dealer

The availability of new machines can be expected to have a profound influence on the sales of surplus, particularly among the larger and wealthier manufacturers. Many builders are beginning to offer their new machines incorporating such radical improvements in productivity and automatic operation that the large producer cannot afford to employ the older style machine, even though it can be had at a substantial saving in original cost. War shortages of critical materials, plus the necessity for concentrating every effort on producing their regular line of equipment, prevented most builders from going ahead with their plans for new developments. Now that war controls have been relaxed, however, rapid progress is being made, and the early months of 1946 should see some startling innovations in several well-known lines.

If the production of these new machines is delayed by strike-imposed shortages, either of men or materials, manufacturers will be obliged to accept the older machines from surplus, to the detriment of the machine tool builder and of the entire national high production schedule.

Among smaller manufacturers, who after all make up more than 75 pct of all American production, there is an increasing tendency towards modernization through the purchase of relatively new machines from surplus. This movement, however, is somewhat hampered by the existing tax program which establishes the life of a machine tool, for amortization purposes, as 20 yr. There is no question but that a machine will last for 20 yr, or even longer, but in most cases its efficiency as a producer, after 10 yr of service, shows a decided drop, and after 15 yr is so low in comparison with modern machines that it is a very poor economy to keep it in operation. An authoritative estimate places the number of machines 15 yr old or older, actually in use in the U. S. A., as 600,000. If these could be replaced by machines out of the surplus stocks, the whole tempo of production could be

increased. The old machines could, and should, be scrapped, but it would be necessary to offer a manufacturer some practical inducement to do this. The simplest way would seem to be to offer a price reduction on the new machine, below that established by the Clayton formula, upon presentation of proof that a corresponding machine had been scrapped, and also, though this would not be so simple, to convince the Treasury Dept. that machine tools should be written off at a rate somewhere between 7 pct and 10 pct a year. Actually, this would not mean a loss of revenue, because the greater profits resulting from the use of the new machine, together with the tax income resulting from the sale of the increased number of units produced, would in all probability bring in an even greater return.

Strategic Reserves

There has been considerable agitation in favor of the armed services retaining a number of machines as a strategic reserve, and while there are indications that this is to be done, the quantities thus far set aside have been negligible. In some quarters it is felt that only the special machines, designed at huge cost and applicable only to armament production, should be saved, but such a policy completely ignores the fact that by far the greater percentage of machines used in war production are of the standard type, but it was these that proved to be the greatest bottleneck in the early days of the war.

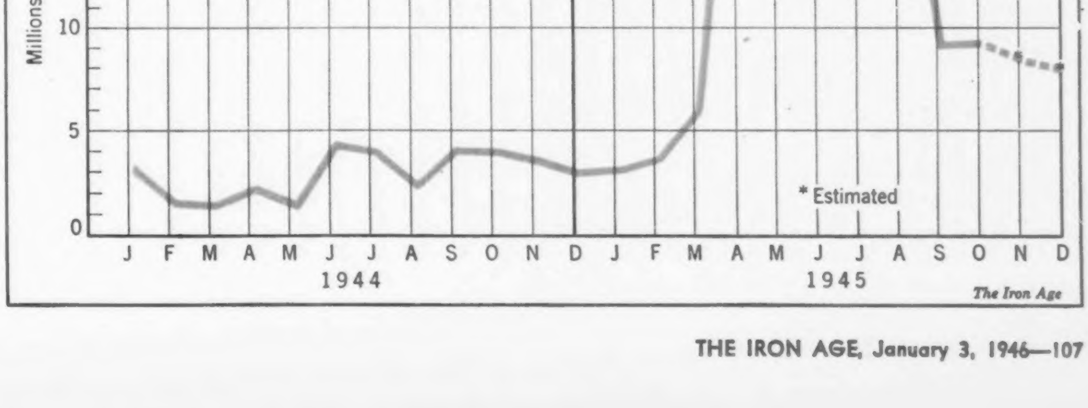
Opponents of the scheme point out that the science of war is changing so rapidly that any machines placed in storage now will be obsolete within a few years due to the obsolescence of the weapons they were designed to produce. This might be true of the special machines, but would hardly apply to standard equipment. In any event we cannot, as a nation, afford to dissipate our productive capacity for war on the theory that the next war, if it comes at all, is years and years away. For all that is known now, the next war may come tomorrow, or next month, or next year, and at this time more than ever the country is in the mood to abide by Washington's theory, "To be prepared for war is one of the most effectual means of preserving peace."

Concerning foreign markets, the prospects are not too bright. It was hoped at one time that the devastated countries would offer a very substantial market for surplus tools, but this has not turned out to be the case. Lend-lease contributions in machine tools have been enormous, amounting to $675,017,000 between March 1941 and March 1945, of which almost two thirds went to Russia and almost one third to the United Kingdom, the remainder being split between 59 other countries. This, however, is not proving the main obstacle to sales; the fact is that many of these countries, and Russia in particular, are not interested in used tools at any price. They want them new, and they want the best. There have been a good many inquires from France, Belgium, China, and Russia, but sales are not forthcoming in any volume. This may be due partly to the difficulty in obtaining proper credits through the Export-Import bank, but is also undoubtedly occasioned by the fact that delivery dates are extremely unsatisfactory. Most American builders are quoting 6 to 9 months delivery, while Britain is quoting only 60 days, and as a result is capturing a substantial slice of business which would normally come to America.

Foreign Markets

Germany, of course, offers no market at all. Despite the apparently cataclysmic damage wrought by Allied bombers, machine tools appear to have suffered very little, and it is estimated by competent authorities that not more than 15 pct of all German machine tools were damaged beyond reasonably rapid repairs. It has also been stated that the number of machine tools in active use in Germany at the end of the war exceeded the number in use in the U. S. The quality of the tools is excellent, and most of them appear to be not more than 5 years old. For the most part they are of standard types, some of them closely following American patterns, with little emphasis on special-purpose, automatic designs, although some cases are reported of machines technologically superior to our own. Much, indeed most, of this equipment will be removed as reparations by the Allies, and whatever may be required by Germany's permissible postwar industry will undoubtedly be supplied by her own machine-tool industry. Whether Germany will offer

AFTER maintaining a fairly constant level through 1944, with an average of around $3¾ million per month, cancellations of machine-tool orders began to climb during the first three months of 1945. April saw a peak of over $22 million, evidently induced by a widespread belief that victory in Europe was in sight, but this was followed by a sharp recession until August, when VJ-Day brought a total of $24,278,935. From that time on, monthly cancellations have run close to the $9 million mark, and indications are that they will continue to fall through the coming months.

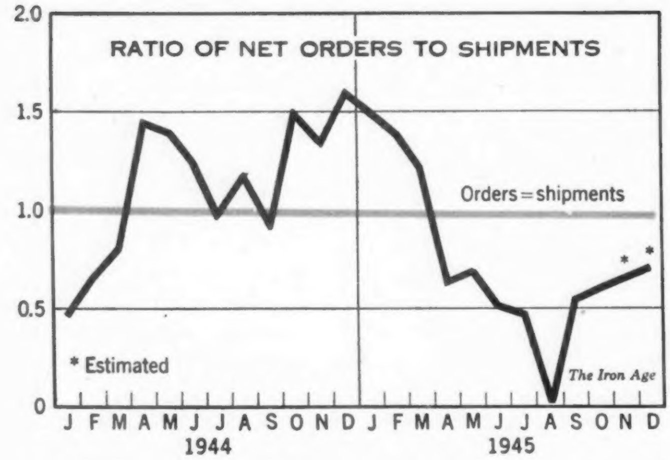


competition in the export market remains to be seen, but this does not seem probable for at least the next few years.

Never have there been so many technological advances made in so short a time as during the past 4 years of war, and it is safe to say that the design of machine tools has advanced at least 50 yr during that time. During the early part of the U. S. national war-production program, when the special-purpose, multiple-operation, automatic machine tool began to come into general use for practically the first time outside of the automobile industry, there was considerable speculation as to what position it would occupy in the postwar world. During the past few years many manufacturers have learned for the first time the advantages of these machines; machines, for example, that will spotface, drill, ream, countersink, counterbore, and tap one particular part in one tenth to one hundredth of the time required with standard equipment. Perhaps the particular machine now in their plants, and designed to operate on a tank transmission, cannot be used on the frame of a washing machine, but the same principle, the same type of machine, can be used to great advantage. Unfortunately such machines require considerable capital outlay, although in many cases this will be less than the outlay required for the large number of standard machines necessary to give equal production. To justify such expenditures, however, a manufacturer must be assured that there is a market for his product sufficiently large to keep the machine running continuously throughout the working day, for only in this way can he reap the benefit of it. If the productive rate of the machine is such that it is required to run for only 1 or 2 hr a day, it would probably be cheaper to use standard equipment. These special machines can be operated by semiskilled labor, of which there is a plentiful supply already trained on similar equipment, and it remains for the builder to sell his client on the idea of a vastly expanded market for his product, brought about by lower manufacturing costs and lower selling price.

On the other hand, the builder of conventional equipment may be able to offer faster delivery, since his machines are standardized and no special design or pattern work is required. He can offset the advantages of the lower price of second-hand, war-weary machines by incorporating into his new product all the improvements which have been developed during the past few years, but which he has been unable to apply, except in special cases, because of the scarcity of certain materials and the need for extremely fast deliveries. He can offer the advantage of 100 pct flexibility, replacement parts from stock, and innumerable attachments to improve the adaptability of his machine, plus, of course, substantially lower first cost.

It is then for the manufacturer himself to decide which type of equipment he is going to use; automatic machines for huge production at lower unit cost, but with big capital outlay, or conventional machines for smaller production at perhaps higher cost, but with lower outlay. The decision in many cases will not be too easy. If he commits himself to the use of automatic machines, and sales do not come up to his expectations, he may find himself faced with a substantial deficit at the end of the year. If, on the other hand, he elects to employ standard equipment, and sales exceed his expectations, he may be handicapped by lack of production facilities and find that his unit costs are higher than those of his competitors who chose the other path.



MACHINE-tool shipments throughout the year maintained a fairly steady, though generally slightly downward trend as new orders eased off and the backlog began to be absorbed. Net orders, however, tumbled sharply to the lowest point since the outbreak of war, amounting in August to only $2,610,510. Thereafter, as reconversion got under way and cancellations fell off, they began to climb to what is hoped will be normal business for several years to come.

It would appear that there will be ample business for both branches of the machine tool industry, the standard and the special, but it is becoming increasingly evident that special machines are destined to fill a much more important place in industry than hitherto. Many of those that were built for strictly war purposes will have to be scrapped or held in reserve for future military purposes, but the lessons learned from their use have had a profound effect on the thinking of production engineers who are loathe to return to the ways of their predecessors. This trend is being expressed in a wide variety of manufacturing plants, and builders are responding eagerly to it.

Increased Automaticity

Not only are special, automatic machines being built, but old-established builders of standard equipment are showing unmistakable signs of following the trend towards automaticity by incorporating automatic control and automatic cycling devices on their machines, without, however, sacrificing the complete flexibility which is their outstanding feature. At this writing, only a few announcements of this new equipment have been made, partly because there is still considerable engineering work to be done on the new models, and partly because some manufacturers hesitate to invest vast sums of capital in promoting new machines with huge undisposed surplus stocks still hanging over their heads.

In the case of presses, the situation is somewhat different, and there is a serious shortage of press capacity throughout the country. Most of the very large presses were taken over for war work, and in many cases the original owners are not particularly anxious to get them back. They have been pushed to the limit in four years of continuous operation, and are showing definite signs of wear; moreover, many of them have been so modified that the cost of reconverting or rebuilding would exceed their value. Relatively few presses in usable condition are appearing in the surplus stocks, as they are apparently being taken over by lessees in possession. The same press, for example, is needed by an airframe manufacturer

whether he produces one airplane a day or fifty, the only difference being in the length of time the press operates. Furthermore, the very noticeable swing to the use of stampings and weldments, in place of castings and forgings, is placing a heavy demand on this type of equipment. This is particularly noticeable in the agricultural implement field, but is also spreading in other directions, and the stamping industry is making a strong bid for a very substantial share of postwar business.

Last Year's Developments

The past year has seen some interesting developments in production processes, perhaps the most important being the increasing interest in negative rake-angle milling applied to steel. There is still considerable controversy over optimum cutter speeds, one school holding out for moderate speeds, while the other maintains that maximum efficiency can be had only at extremely high speeds. The matter will probably never be settled to everyone's satisfaction, but it seems likely that the majority will favor the higher speeds.

The subzero treatment of tool steels continues to attract attention, and while there are many instances in which this is of distinct benefit, it is by no means a cure-all, and in some cases may be of negative value. The use of cemented carbides has expanded considerably since the end of the war, not particularly in the cutting tool field, where it is already firmly established, but in other directions. While the supply of these was adequate to meet all normal wartime demands, there was not available the engineering personnel or the material to carry out the experimental work necessary for new applications. Some extraordinary results are now being reported from carbide dies on punch presses, carbide gear hobs, and special drawing dies, and there are many new applications to machine parts and wearing surfaces, including some experimental work on carbide bearings for precision spindles.

Gear shaving has found a wider acceptance during this past year, and in view of the improvements made in furnace control and quenching, bids fair to make still more substantial inroads into the gear grinding field, even in those industries, notably the aviation engine industry, which have generally opposed it. The crush forming of grinding wheels is a new technique that promises still further development in the near future. Eliminating the use of diamonds for dressing, a steel roll of the desired form is forced against the face of the wheel which is thus crushed to the corresponding form. In addition to its use in ordinary form grinding, this process has been successfully applied to the production of accurate threads on centerless grinders.

Future Outlook Bright

Generally speaking, the outlook for the machine-tool industry for the next year or two appears bright. The recent changes in the Clayton formula, extending it to cover machines up to 25 yr old, should prove very helpful in ridding plants of their outmoded equipment in favor of either new or good surplus machines, and if the labor situation can be cleared up within a reasonably short time there seems to be no reason why builders should not continue to operate for at least some years to come on a level appreciably higher than that of prewar.

The forthcoming steel strike, however, is throwing a heavy shadow over the whole picture, and if it continues for any appreciable length of time must inevitably have serious effects. Steel stocks in both plants and warehouses are generally low, and if supplies are cut off it is doubtful whether manufacturers can continue to operate for more than a few weeks at best. Some companies may make use of this period of inactivity to overhaul their own manufacturing equipment which has been operating at top speed for a long time and which they have been obliged to neglect, except for essential repairs, in order not to delay deliveries more than could be helped. Even this, however, can continue for only a very limited time, since the supply of components, bearings, etc., will likewise be restricted by the strike to an even greater extent than at present.

Unfortunate as they are, these labor troubles seem to be the natural aftermath of every war, but, like all family squabbles, are usually straightened out without too much harm being done to either side. Nevertheless, by their very existence, they are a sound indication that democracy still works.

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THE close of 1944 saw unfilled orders reach a total of $260,880,000. This was surpassed during the first three months of 1945, rising to a peak of $296,859,131 in March, and then declining steadily to $172,982,400 by the end of October. Despite this continued decrease in the size of the backlog, manufacturers are still quoting 6 to 9 months delivery on new machines.

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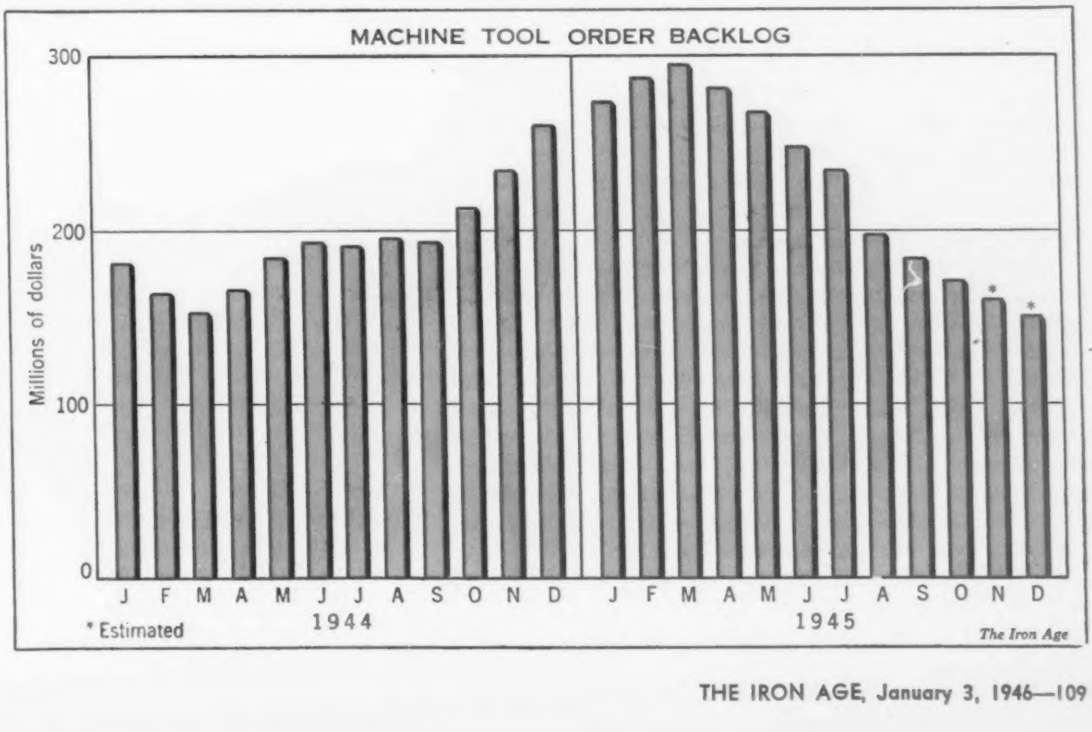


CONSUMING

Steel consumption this year will be limited only by the industry's ability to produce. The pentup demand of a variety of steel consuming industries appears to be greater than at any time in history, simply because the consumer, industrial and individual, has been deprived for four years of practically every item of which plain and alloy steels are major components.

Automotive Industry

THE prospect that 1946 will be the greatest production year in the history of the automobile industry still exists, but the likelihood is diminishing day by day due to the uncertain labor situation.

With labor the most important single factor in the Detroit picture, it merits initial consideration here. The immediate reason for the conflict between managements and the CIO United Automobile Workers Union is wages, but underlying that issue are the many grievances which piled up during the war on both sides and made inevitable a slugging showdown fight such as started in G.M. the day before Thanksgiving.

The outcomes can be predicted with a fair degree of certainty. The union will survive this battle as it has survived many others, although the chances are for the first time since UAW became a force in the auto industry—in 1937—that it will emerge a loser rather than a winner in the dispute. It can be expected to come out with a wage increase of 15 to 20 pct or thereabouts, but this is quite a way from its 30 pct position. It cannot be expected to achieve any notable success in its call for a hand in profits and product price-fixing.

The big question mark is whether the higher wage rates—whether they are 15 pct or the full 30 pct—will enlarge worker productivity correspondingly. In this respect the negotiations between UAW and the Ford Motor Co. are especially noteworthy. Ford has demanded company security as its price for wage raises and continued union security. It may be that out at the Rouge, where so many other significant experiments have taken flower and grown, will also be seen during 1946 the beginning of an idealized pattern of labor-management relationships.

If labor and management get together in Detroit and automobile production begins to move the way it can, a period of unequalled prosperity for the industry and those associated with it should follow. The market for new automobiles is perfectly stupendous.

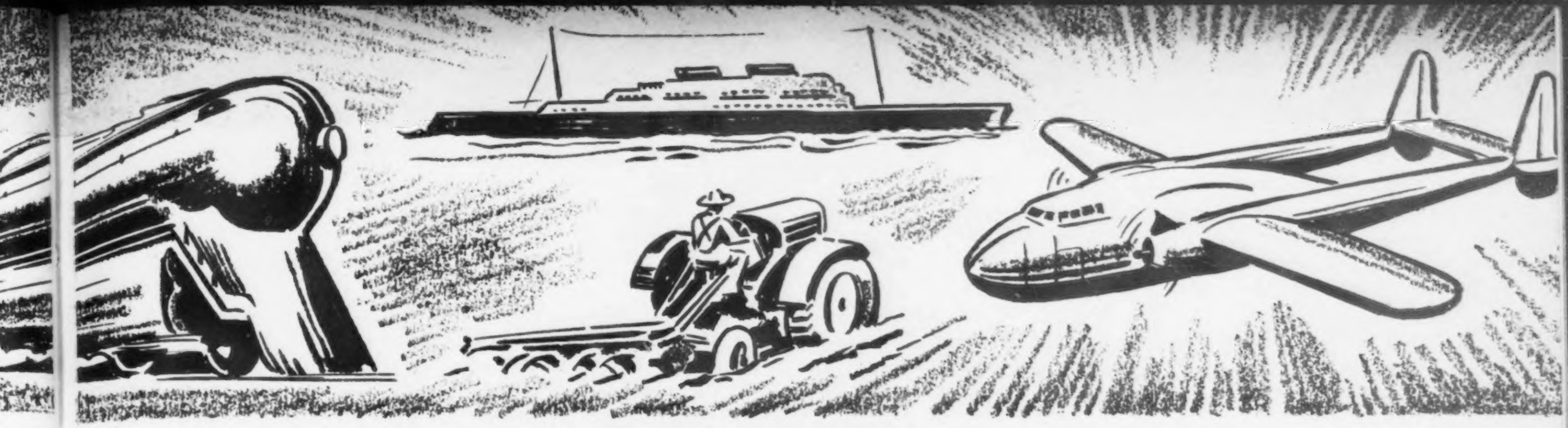
In 1941 total registrations of passenger cars came to 29,601,774 units, and truck registrations aggregated 4,859,244. This sum total of 34,461,081 cars and trucks was about six pct higher than any other total in history.

As of the middle of 1944, based on the official figures of the United States Bureau of Public Roads, these registrations have fallen off to 30,086,189 cars and trucks, of which 25,572,849 were passenger cars and 4,513,340 trucks. The likelihood is that as of today the aggregate figure is down around 29,000,000, off better than 5,000,000 from the 1941 peak.

There is a ready market, therefore, for close to 5,000,000 passenger cars and probably around a half million trucks, just to fill replacement demand alone. It is expected in analytical divisions of the automobile companies that practically all of this replacement total will be taken up as fast as possible, despite the higher prices appearing on the 1946 models.

The current models are coming out in limited quantity, and that is perhaps just as well, because there does not appear to be any great public enthusiasm for them in the tradition of past years. Demand will certainly take up all of the 1946's which are built, and then there will be a spillover into the 1947 series and those to follow. It seems reasonable to say that this year's car and truck production, United States and Canadian plants included, will run somewhere around 5,000,000 units, nearly half of these concentrated in the last four months of the year when—it can be expected and prayerfully hoped—large scale labor troubles will be a thing of the past, and full speed forward will be the rule.

Precisely how this boom production will be shared is anybody's guess, but the sharpies in Detroit are betting that Ford Motor Co. will have a larger proportion than at any time during the past decade. Some-



INDUSTRIES

By T. E. LLOYD and S. H. BRAMS
Pittsburgh Editor *Detroit Editor*

thing of a renascence has taken place out at the Rouge, and there is just one objective in that sector: get back on top. Not since 1937 have Ford passenger cars been turned out in equality or better with Chevrolets, and after nine years of taking the second place the energetic young crew headed by Henry Ford II is thoroughly fed up with the situation and determined to do something about it. In the immediate prewar years, Ford's total of the industry ran around 20 pct, the Ford-Mercury-Lincoln total being less than the aggregate for not only General Motors but Chrysler Corp. as well. The way things are humming out at the Rouge it would be in no way surprising to see Ford wrest second place from Chrysler in the big three, and seriously challenge Chevrolet for the individual top position.

General Motors has some ideas of its own for retaining sales leadership. In fact, it is gearing itself up to build all by itself somewhere around 6,000,000 cars and trucks—about as many as has been talked of in conservatively optimistic quarters for the entire automobile industry. To accomplish this General Motors is building a dozen new plants from coast to coast, a few of them designed to relieve bottleneck machining operations in the Chevrolet Div., and several of the others intended to develop a vastly expanded Buick-Olds-Pontiac manufacturing and merchandising setup.

And then there are the independents. Studebaker has been achieving increasing stature during the war years and stands at the point where it probably should be figured as a definite competitor in its price class, rather than a hanger-on. Nash has some large scale plans built around its "600" lightweight sales leader. Packard may edge down into a lower price class in order to improve its volume. Hudson and Willys have aggressive intentions as well.

Thus so far no mention has been made of the newcomers to the automobile business. Two are positives: several are tentative. Kaiser-Frazer Corp., having leased the Willow Run bomber plant in a great fanfare of publicity last fall, is moving along well on its path toward production of two new lines of automobiles, one the Kaiser, the other the Frazer, intended for production in February. Then there is the Crosley automobile, powered with a radically different Taylor engine (THE IRON AGE, Sept. 13, 1945, p. 86) expected to be ready for the civilian market in March. The Mathis, a midget package planned by the erstwhile French manufacturer, being worked out on Long Island, and those ebullient gentlemen of Cleveland, Jack & Heintz, are hinting darkly that they may go into the automobile business themselves sometime next fall, employing another new engine creation, the Skinner (THE IRON AGE, Oct. 18, 1945, p. 76).

So far as steel is concerned, the automobile market will probably be about the same as it has always been. There will be just about the same quantity of tonnage per car, over the average, with tendencies toward lightness in frame and chassis being balanced—at least for the next year or so—by increasingly heavy bumpers and other accoutrements intended to prettify the exterior and increase its glitter. Sooner or later during 1946 the auto purchasing agents will voice determination to go back on the old basis of quarterly pricing, but likely by the time they make this demand the situation will have settled itself enough so that it is feasible once again.

Meanwhile, some modestly enlarged use of aluminum in the automobiles of 1946 and the vastly changed versions for 1947, to follow next fall, can be expected. Scrap aluminum is cheap, and as long as it is cheap it is economical to use in engine parts which do not require the virgin ingot—hence the already increased specifying of the light metal in 1946 cars. This can be expected to continue as long as there is a large quantity of surplus aluminum on the market, and from the pictures of the airplanes that are being scrapped, there will be a large quantity for some little time.

Railroads

THE ultimate limit of new passenger and freight equipment, as well as rails and locomotives, that will be acquired by the railroad industry in 1946 appears to depend solely upon the steel industry's ability to produce the steel required to build them. The demand that has accumulated for passenger and freight cars and other railroad equipment has reached the stage that it is difficult to separate the actual from that which might be called "dream" demand. However, it is known that the actual demand is substantially greater than at any time in railroading history. Railroads right through the war received about 5 million tons of steel a year, but the load placed upon them was

such that far above this amount could easily have been utilized.

With railroad current assets exceeding liabilities by more than $1.75 billion, probably for the first time in the history of railroads; with equipment badly worn by four long and hard years of service to transport the bulk of the materials used to win a world war; and with the bulk of the equipment obsolete and antiquated, railroads can be counted on with certainty to start a program of modernization the like of which has never before been seen. That program will continue over many years to come, but its immediate success, as pointed out, will depend largely upon the steel industry's ability to produce the necessary steel products to carry it out.

Car, locomotive, rail, and auxiliary equipment orders have shown the direction of the trend in railroad buying. On Nov. 1, 1945, Class I railroads had on order 37,904 freight cars, including 12,459 hopper, 4834 gondola, 1222 flat, 14,811 plain box, 3669 automobile box, 769 refrigerator, and 50 miscellaneous cars. On the same date, 520 locomotives were on order, of which 117 were steam and 403 were diesel. During the first 10 months of the year, 33,696 freight cars were put into service and 522 locomotives were put into service. Likewise, on the same date, 1200 passenger cars were on order.

The rail supply picture has certain ramifications that are beyond the control of the railroads. Rail production in 1946 will be considerably below the steel industry's rail rolling and controlled cooling capacity and less than two-thirds the tonnage that railroads would like to have. Rail deliveries in 1945 totaled about 2 million tons, compared to a rolling and controlled cooling capacity of 2.4 million tons. Railroads would have liked about 3 million tons in 1945. Price apparently is the bottleneck in rail production, and the refusal of OPA to grant price increases late in November 1945, killed any chance the railroads had of getting close to the desired tonnage in 1946. Most mills produce rails at a loss or at low profit, and there has been a marked inclination to divert semi-finished steel to other more profitable products. Of all rail producers, only Colorado Fuel & Iron Corp. is reported to have booked tonnage close to capacity in 1946. The situation on track accessories is even more gloomy, since, like rails, they are a poor profit item. Present indications are that about 1.8 million net tons of rails will be rolled in 1946.

With about 57 pct of the 42,000 Class I railway locomotives (about 24,000) over 25 years old at the end of 1945, there is an expected boom in locomotive construction. Baldwin Locomotive, at Philadelphia, recently reported that it had orders on its books for $50 million, of which 70 pct was for foreign delivery. However, Baldwin reported that the domestic market promises much. The Civilian Production Administration, peacetime version of WPB, estimated that June 1946, locomotive deliveries should be 955 pct of the 1939 monthly average, while employment in locomotive builders' shops should be 378.5 pct of the monthly average in 1939. In 1941, before government regulations curtailed procurement of motive power, 1436 locomotives were ordered. Because traffic and earnings of the railroads are expected to exceed those of 1941, annual purchases of locomotives for several postwar years probably will considerably exceed the number purchased in 1941.

The potentialities of electrification should not be forgotten. Many more roads likely will be equipped for electrical operation. New forms of motive power are assured, namely steam-turbine and gas-turbine drive. These two features together may bring a new era in railroading. Many of the roads have been experimenting with the steam and gas turbines, both of which have been found excellent from the standpoints of cost, efficiency and speed. Experimentation on fuels for the gas turbine, being carried on in many quarters, seems to assure the future of this prime mover in the railroading industry.

Freight car orders during the immediate postwar years, according to "The Postwar Railway Market for Manufacturers," are expected to average better than 118,000 cars a year, with 1946 and 1947 leading the way and the following years showing gradual declines. One important factor in this regard is the trend by manufacturers to develop designs of cars that are specifically suited to individual types of hauling and will show material operating economies as compared with standard types of cars now in service.

Passenger car construction will likely undergo the greatest change from the standpoint of design. Car-

TABLE I

Estimated Steel Consumption in 1946 by the Railroads

Product	Iron and Steel Plants Disposal Report to Senate Committee on Military Affairs			J. A. Krug's Report on "Production"	The Iron Age
TOTAL *	5,700,000	5,000,000	7,400,000	6,090,000	6,500,000
Rails	2,055,000	1,860,000	2,670,000	2,210,000	1,800,000
Track accessories	895,000	775,000	1,170,000	956,000	770,000
Structural and piling	483,000	422,000	635,000	525,000	850,000
Plates	883,000	755,000	1,140,000	941,000	1,300,000
Bars, carbon and alloy	435,000	369,000	550,000	453,000	600,000
Concrete reinforcing bars	6,850	6,000	8,800	7,300	8,000
Black, terne and tinplate	2,850	2,500	3,700	3,000	2,000
Galvanized sheets	62,000	53,500	79,000	65,200	70,000
Hot and cold-rolled sheets	224,000	186,500	277,000	229,000	300,000
Hot and cold-rolled strip	83,000	73,000	108,000	88,900	120,000
Pipe and tubing	69,000	59,500	90,500	74,600	90,000
Wire products	62,300	54,000	82,000	67,000	90,000
All other finished products	439,000	384,000	578,000	470,000	500,000

* Only totals are accredited to named sources. Product breakdown on basis of past performance.

builders the country over are scraping the bottom of the barrel for ideas to incorporate into passenger cars. While many of these, in use, may turn out to be impracticable, it is certain that railroads will leave no stone unturned to recapture and hold passenger traffic that is being lost to other types of transportation, especially the airlines.

Passenger car building capacity is estimated to be about 4500 cars a year, and currently there are some 1300 new cars on order. While there will probably be no great increase in construction capacity, there is expected to be a substantial increase in 1946 of car orders, many of which will be in the form of complete trains rather than for individual cars. Like freight cars, much of the passenger equipment in use today is very old. Of the 38,500 passenger train cars in use on Jan. 1, 1945, 49 pct was over 25 yr old, 14 pct was between 21 and 25 yr old; 24 pct was between 16 and 20 yr old; 5 pct was between 11 and 15 yr old; 4 pct was between 6 and 10 yr old; and 4 pct was less than 5 yr old. Thus, it can be seen that if railroads hope to compete with newer types of mass transportation, those figures will almost have to be reversed. Railroads recognize this and plan to do something about it.

A total of 6,500,000 net tons of finished steel will be consumed in 1946 by the railroad industry, according to estimates by THE IRON AGE. Other sources, four of them, net consumption at 5,000,000, 5,700,000, 7,400,000, and 6,090,000 net tons respectively. The first three estimates were made in the Iron and Steel Plants Disposal Report to the Senate Military Affairs Committee. The fourth estimate was made by J. A. Krug, former chairman of the War Production Board. In table I is shown an approximate breakdown by products of steel consumption by railroads, calculated from the total estimates made by the named sources, on the basis of past performance of the industry.

Shipbuilding

WHILE the end of the war meant layoffs by the thousands in shipyards all over the country, it did not sound the signal for a complete blackout in shipbuilding. Ships will be built and ships will be repaired. Lake boat construction, however, looks pretty dim for some time to come, only because of the excellent construction program that was carried out during the war in order to meet the North's needs for coal; the steel industry's demands for increased tonnages of iron ore, and a world's cry for grain. However, the old line shipyards, Bathe, Federal, Bethlehem, Newport News, New York Ship, and Cramp, expect to find themselves with sufficient new construction and repair work, as well as reconversion of ships for peacetime trade, to carry on at a fairly substantial rate of operations for some years.

As every other heavy industry, shipbuilding is faced with government-owned surpluses of ships that will be disposed of in time by some means or another. The means of disposal, formulated in a bill in Congress not yet passed, is still uncertain. Much of the success of the shipbuilding and the shipping industries during the postwar years will depend upon the contents of this bill after its passage. During the war, specifically from July 1, 1940 through July 31, 1945, a total of 5425 ships were built by the Maritime Commission, totaling 53,239,000 deadweight tons. Shipbuilding during the war is estimated to have accounted for 21.9 pct of the cost of munitions production in the United States.

Of the 5425 ships built for the Maritime Commission, 479 were standard cargo ships, totaling 4,701,000 deadweight tons, 3037 were emergency cargo vessels of which 2686 were Liberty ships of 32,756,000 deadweight tons and 351 were Victory ships, of 3,809,000 deadweight tons. Other dry cargo ships, excluding the cargo attack vessels, numbered 297 with a deadweight tonnage of 1,395,000 tons. The only other strictly non-military ships built by the Maritime Commission were 700 tankers totaling 10,747,000 deadweight tons. The remaining ships, 609 in number and 2,813,000 deadweight tons, were military type vessels such as the cargo and transport attack ships.

As to the maritime type ships suitable for ocean going traffic, at the close of the war there was estimated to be about 2000 ships totaling 50,000,000 deadweight tons. Many of these, built for five years of useful life, are pretty well worn out. Others, such as the Liberty ships, are not too suitable for normal shipping mainly because their payload is relatively small and their draft is too great for coastwise opera-

TABLE II

Estimated Steel Consumption During 1946 by the Shipbuilding Industry

	Iron and Steel Plants Disposal Report to Senate Military Affairs Committee			The Iron Age
TOTAL*	450,000	500,000	600,000	500,000
Rails	270	300	360	300
Track accessories	90	100	120	100
Structural and piling	69,300	77,000	92,400	77,000
Plates	285,000	316,200	280,000	316,200
Bars, carbon and alloy	31,000	34,500	41,400	34,500
Concrete bars	360	400	480	400
Black, terne and tinplate	90	100	120	100
Galvanized sheets	3,250	3,500	4,200	3,500
Hot and cold-rolled sheets	9,400	10,500	12,500	10,500
Hot and cold-rolled strip	1,800	2,000	2,400	2,000
Pipe and tubing	14,800	16,700	19,600	16,700
Wire products	5,800	6,500	7,800	6,500
Other finished products	28,800	32,200	38,600	32,200

* Totals only are officially estimated by ascribed source.
Product breakdown is on basis of 1935 to 1940 consumption.

tion. Others are too costly to operate. However, cargo vessels, tankers, and combination cargo and passenger vessels are good ships and are desirable to shippers.

Much of the warbuilt shipping now plying the oceans will end up in the scrap pile while much of it will be purchased by private shippers, provided a fair disposal system is worked out. The balance between scrap and sales is not known. However, regardless of this, there will be new shipbuilding. Already several companies have scheduled construction of new ships. One company would like to order three 40,000-ton coastwise vessels, while another shipping line has already started construction on 10 combination passenger and cargo vessels for the South American trade.

Many shippers and shipbuilders alike feel that the superliners are out as far as this country is concerned, and that the normal passenger ship will run about 20,000 tons. The superliner, it is believed, cannot compete with air in speed, and for superliner service premiums are charged on passage that prohibit their use. Despite this, however, the "bold and daring" American Merchant Marine dreamed of by the late President Roosevelt seems assured in plans recently announced. According to the Maritime Commission, 11 luxurious superliners, 33 pct faster than the best American ships now in service, will be built. These ships will displace 37,500 tons each and have a speed of 29 knots. The commission has $225,000,000 available to build these ships, and construction will begin shortly on two ships which have already been allocated to the San Francisco-Japan run. According to the *New York Times*, these ships will probably be built at Alameda, Calif. They will not be nearly as large as the British *Queen Mary* and *Queen Elizabeth;* but their speeds are comparative.

A short time ago, Rear Admiral Emery S. Land, chairman of the U. S. Maritime Commission and War Shipping Administrator, stated in *Ships*, a publication by the Shipbuilders Council of America, that it was not known how many ships could be maintained by the United States in profitable postwar service. However, Admiral Land has adjudged America's peacetime shipping requirements: Foreign trade—7,500,000 deadweight tons; for coastal and intercoastal transportation—3,800,000 deadweight tons; Great Lakes—3,500,000 deadweight tons; and for river transportation—2,500,000 tons.

While never before in a position to compete with foreign countries in the construction of ships for foreign merchant marines, American shipbuilders do find themselves in this position in 1946. France, buying ships built by other nations, may try American shipbuilders. British yards took some of this business, as did Scandinavian yards, but these yards are loaded to capacity.

Consequently, as a last resort, American builders are thought to be destined to play a part in the rebuilding of the French merchant marine, regardless of the cost and the uncertainty of the exchange rate.

Construction of inland waterways towboats and barges is expected to hit high levels in 1946. Already many bids have been requested and quite a few awards have been made for barges. Steel companies are eyeing the rivers with considerable interest, figuring on ways and means of getting their products into the south and southwest and to tidewater as cheaply as possible. Coal barges are being built, as are barges for such products as finished steel, oil and other products. Barge yards have been receiving a considerable number of inquiries from foreign countries for prices on tows and barges. Prospective buyers in Switzerland, Holland, France, South America and Russia have asked for quotations, and, according to George A. Zerr, river editor of the *Pittsburgh Post-Gazette*, inquiries have been received on diesel-powered towboats and barges for service in Sumatra and Java river traffic. This equipment is designed to carry building materials and machinery to interior points and return to tidewater with crude rubber.

Discounting foreign business, which is neither predictable nor certain, the shipbuilding industry's steel needs in 1946 are estimated by THE IRON AGE to total about 500,000 net tons of finished steel products. Three other estimates, based on the Iron and Steel Plants Disposal Report to the Senate Committee on Military Affairs, are: 450,000 net tons, 500,000 net tons, and 600,000 net tons, respectively. In these estimates, shown in table II, the totals only are ascribed to the named sources. The breakdown by products of these estimated total steel requirements, is based on the consumption of such products during the years 1935 through 1940.

Oil Industry

THE petroleum industry, emerging from four years of war, faces more internal reconversion problems than perhaps any other basic industry, mainly because of its diversification and ramifications. In addition to being a producer of a basic and vital material, the industry refines its product, transports it by its own pipelines, barges or tankers, further processes it and delivers it into a multitude of channels to industrial and individual consumers.

The war has taken care of industry-wide expansions for some time to come. Of course, there will continue to be the new explorative operations and new oil fields discovered; refinements will be made in productive techniques, and new products will bring them new productive equipment, but basic expansion is not likely to be of much significance. Neither is there expected to be any extensive domestic pipeline capacity added, even though there is at present three or four lines under construction, in California and in Texas.

J. A. Krug, former chairman of the War Production Board, in his recent report entitled: "Production, Wartime Achievements and the Reconversion Outlook," estimated that the petroleum and gas industries would require during 1946 a total of 2,538,000 net tons of iron and steel products. Other estimates of the industry's steel needs during the immediate postwar years have been made. Based on the 1937 pattern of distribution, the Iron and Steel Plants Disposal Report to the Senate Committee on Military Affairs gave two estimates of the industry's annual steel consumption, one of 3,700,000 tons and the other, 4,800,000 tons.

Another estimate, given status because it was offered as testimony at the same hearings, showed that the industry would require 3,500,000 net tons of steel a year in the immediate postwar years. Further, an estimate based on data procured by THE IRON AGE, pegs expected 1946 consumption of steel by the oil, gas, water and mining industries, the bulk of which is by oil and gas, at 2,000,000 net tons. THE IRON AGE steel consumption estimates are purposely set low because of the uncertainty of steel production rather than any lack of demand on the consumer end. The other estimates, made some months before the end

of the war, are believed to be high because the problem at that time was one of trying to tabulate postwar dreams on the basis of known past performances. Details of these estimates, with an expected product breakdown, are shown in table III.

Some observers feel that the petroleum industry in 1946 will better its past drilling record of 30,000 wells in 1937, while more conservative estimates range between 24,000 and 28,000 drillings. Since this opinion is based more on projections made some months ago rather than actual drilling programs, the real status of the estimate is uncertain. That oil production will fall off in the immediate postwar years there is no doubt. As early as September 1945, curtailment of oil production started, a measure designed to prevent damage to overworked fields. From an average of about 4 million bbl a day in 1939, the war demand pushed production up to more than 5 million bbl per day. Albert J. McIntosh, economist for Socony-Vacuum Oil Co., recently was quoted as saying that the first postwar year refinery runs in the United States would be about 3 pct greater than 1941, the last peace year. Auto production, likewise, will determine oil production to a large extent. At present, there are about 4 to 5 million cars less on the road than during prewar years. The speed of replacement, now very slow, will tend to depress oil production.

The oil industry, in its war effort, greatly expanded three major phases of its operation—production, refining and transportation. Refining facilities were built at a cost in excess of $1.3 billion of which $540 million are government financed. Exclusive of tankers, transportation facilities costing some $425 million were built, in which the government invested about $225 million.

The refinery phase of the oil industry was pretty well set up for war. Except for synthetic rubber, government expenditures were relatively small in this field. There were no calls for new capacity building as with aircraft plants and shipyards, and only one refinery was completely built by the government. The remainder of the expansions were to existing privately-owned plants. Government investments at or to existing refineries including incompleted projects totaled $570,000,000, of which $238.7 million were for high octane gasoline; $48.3 million were for toluene; and $283.1 million were for butadiene and butyl rubber plants.

The aviation gasoline plants were high priority items during the war. The government expenditures of $238.7 million were for 24 different refineries, and an additional $5.6 million were authorized for further additional capital investment at 10 of these refineries. Investment in high octane facilities is estimated to be $1 billion. While government investments in these projects totaled 23.8 pct of the total, in March 1945, production from government-owned facilities was only 12.6 pct of the total output. In the catalytic cracking process, the government has 40 pct of the invested capital, while it has 25 pct of the total investment in the alkylation method of producing high octane gas. With such expanded aviation fuel productive capacity existing, there is considerable concern about the postwar aspects of this field. It is estimated that postwar aviation gasoline demands will only be from 10 pct to 15 pct of the wartime levels, and the bulk of this can probably be furnished 91 octane fuel rather than the 100 octane grade.

Synthetic rubber, of which the oil industry was the primary producer, seems to have a rather attractive immediate future. There is expected to be great demand both domestically and for export for synthetic for the next two or three years, especially since the condition of the rubber plantations in the Far East is uncertain.

Plants producing butadiene from petroleum for synthetic rubber are not easily adaptable for normal petroleum products. Butadiene made from butylenes and butane is far below the cost of that made from alcohol and considerably lower than that made from naphtha by thermal cracking. These lower cost plants, all government-owned, total nine in number with a capacity of 350,000 tons a year or 51 pct of the total capacity. These will be in the best position to compete with natural rubber, but there is much to be done in reducing cost before synthetic is fully competitive in all phases. Thus, disposal here is vital to the industry.

Butyl rubber plants are all located adjacent to refineries from which butylenes are available. Since this type rubber is superior to both synthetic and natural for use in the manufacture of inner tubes and certain

TABLE III

Estimated 1946 Steel Consumption by the Oil, Gas, Water and Mining Industries*

Product	Iron and Steel Plants Disposal Report to Senate Committee on Military Affairs			J. A. Krug's Report, "Production"	The Iron Age
TOTAL	3,700,000	3,500,000	4,800,000	2,538,000	2,000,000
Rails	70,200	66,200	85,400	47,000	37,800
Track accessories	28,800	27,300	37,400	19,500	15,600
Structurals and piling	128,500	123,000	183,000	87,800	70,400
Plates	384,000	363,000	496,600	259,300	207,400
Bars, carbon and alloy	88,500	82,300	112,200	58,700	47,000
Concrete bars	27,500	25,800	35,500	18,400	14,700
Black, terne and tinplate	61,000	58,400	75,300	41,700	33,300
Galvanized sheets	21,500	20,300	32,600	14,500	11,600
Hot and cold-rolled sheets	223,000	211,000	284,000	150,700	120,500
Hot and cold-rolled strip	15,500	14,700	20,500	10,500	8,500
Pipe and tubing	2,362,000	2,251,000	3,090,000	1,607,800	1,286,300
Other finished products	224,000	212,000	281,200	151,400	121,200

* Only the total estimates are credited to individual sources. The Product breakdowns are prorated on the basis of past experience and are calculated to conform to the total estimates.

other products, it seems that this capacity will be utilized without much difficulty.

While no one can tell now just how much tanker tonnage will be needed in the world after the war, the belief is general that there will be a substantial surplus. In 1939, the United States had a commercial tanker fleet of 362 ships totaling 4,235,000 deadweight tons. This fleet was equivalent to only 185 of the new T-2 type tankers of 3,100,000 deadweight tons. The disposal of these tankers will not only have a vital effect on the oil industry but may well be a determining factor in the immediate future of the shipbuilding industry.

Aviation

IN one month from Aug. 1 to Sept. 1, 1945, the aircraft industry's production dropped from a production schedule of about 24,000 planes per month to about 175 planes per month. Thus, the end of the war and military demand almost overnight moved the industry from its enviable position to one of a precarious future.

The anticipated new aircraft construction market is picayunish when compared to war output. Presently, the military services, the main aircraft customer for more than five years, have pegged their schedules at about 2200 planes for the next year and a half. This is a mere drop in the bucket for the over-expanded industry, but it is likely to be increased by about 100 pct. Dr. George P. Baker, special consultant to the War Dept. and Director of the Office of Transport and Communications Policy of the State Dept., at a special Senate hearing, placed annual military aircraft needs between 3000 and 5780 planes per year. This is a far cry from the peak production in 1944 of 96,359 planes.

Another phase of the aircraft construction picture is the commercial airlines plane demand. The Dept. of Commerce estimates postwar annual commercial aircraft production, free of war surplus influences, will range between 325 and 475 ships per year. The private plane picture is one of uncertainty, depending upon the effectiveness of government action in airport construction, improvement of air navigation facilities, the rate of progress in the performance and economy of private planes, the simplification of regulations and the encouragement of education and training in aeronautics. However, the Baker report indicates that the number of private planes to be built in the immediate postwar era will range between 22,000 and 24,500 per year.

Thus, in summarizing the annual expected aircraft production, considering that the war surpluses are not taken into account and the fact that military demands are those still in the recommendation stage rather than an actuality, aircraft output will total between 23,325 and 51,255 planes per year.

In his report Dr. Baker considered only military and commercial engines, which are defined as reciprocating types of not less than 985 cu in. displacement and jet or gas turbine types producing a thrust of 166 lb, showed that the number of engines required will vary between 7540 and 12,650 per year, of which about 33 pct will be jet or gas turbine.

Dr. Baker's chief interest in his testimony before the Senate was to procure funds for the proper dispersal of the aircraft industry, pending the possibility of another war. It was the intention of the report to emphasize the need for using the newer inland aircraft plants for construction and development of military planes, while the older "home" plants of the companies on the East and West Coasts could be used for commercial aviation's needs. This rather thorough study of the industry shows a range of estimates based upon the two distinct plans the committee proposed.

The "A" or higher plan calls for 8400 planes per year, 5000 of which are military; 300,000 employees (15 pct of the 1944 peak employment); and is based on an annual sales value of $1.6 billion of which $1.4 billion is to the military. The second or "B" plan calls for 5000 planes a year, 3000 of which are military; a 200,000 employment figure (10 pct of the 1944 peak); and an annual sales value of $900 million of which $750 million will be accounted for by the services.

From the standpoint of the airlines and the airlines terminals, another picture is evident. Since VJ-Day airlines have been frantically trying to procure equipment, consolidate airlines, map new air routes both domestic and foreign, and start new airlines both scheduled and non-scheduled.

Obviously, aircraft companies could not immediately deliver ships, as required by the airlines, neither of the type nor number needed. The next best thing was to take as much usable equipment as possible from military surpluses. Further, the transport ships have been offered on attractive terms, either on a sale or lease basis, so that even though new equipment were available, airlines would hesitate long before going into the expense of buying it.

The most popular of the surplus military craft insofar as commercial airlines are concerned are the Douglas C-47 two-engine cargo planes for cargo traffic and the Douglas C-54 four-engine cargo planes for passenger traffic; so popular, in fact, that a priority system had to be worked out. Eastern Airlines cancelled a contract for 10 Curtiss CW-20's, the peacetime version of the C-46 Commando, for a fleet of C-54's; American contracted for the reconversion of 50 C-54's for airline use; Pan American has a contract with Republic Aviation Corp. at Farmingdale, L. I., to

TABLE IV

Anticipated 1946 Steel Consumption by the Aviation Industry

Product	Net Tons
Ingots, blooms, slabs, billets, tube rounds and sheet and tie bars	18,000
Structural and steel piling	9,000
Plate	7,000
Carbon bars	11,000
Concrete bars	9,000
Alloy bars	13,000
Cold finished bars	6,000
Pipe and tubes	3,000
Wire nails and wire products	2,000
Hot-rolled strip and sheet	8,000
Cold-rolled sheet and strip	12,000
Galvanized sheet	1,500
Tool steel	500
TOTAL	100,000

convert 20 of these ships; and Martin at Baltimore is converting 12 C-54's for PCA. The C-46 and C-47 are strictly cargo ships and the conversion cost of passenger service is too great to warrant much use. However, it is reported that some airlines are taking these ships for straight cargo use.

As to the C-54, the surplus disposal agencies have pegged the price at $300,000 per ship less $164,000 reconversion costs; which should easily cover the costs of overhaul, new instrumentation, new radio and new seating arrangements. Thus an airline gets a ship with about four years' life for about $136,000. Otherwise, the ships can be leased for $25,000 a year from the government, which frequently proves more attractive, since a ship in operation five years costs only $125,000.

Other types of cargo ships declared surplus by the military are being bought up by mushrooming non-scheduled cargo carriers. For example, Henry J. Kaiser has expressed interest in starting a freight line on a non-scheduled basis, using four C-47 transports purchased from the military. He has guaranteed cut flower shipments east and clothing specialties shipments west. Already National Skyways Freight, Inc., formed by a group of the famous Chennault "Flying Tigers" has put 14 of Budd's stainless steel Conestoga cargo ships into service on a tramp freight line.

Construction of ships of new designs, however, has not been forgotten. Practically every heavy aircraft manufacturer has something up his sleeve for the postwar commercial plane market. Consolidated Vultee has already announced a 30 passenger transport and a 204 passenger land based Clipper, with Pan American already scheduled to get up to 15 of these latter ships. Curtiss-Wright expects to have a new transport ready for production in two years. Martin has anounced the M-202 as well as a smaller transport, the M-228, and has at least one contract with PCA for 35 of the larger ships. Martin, like Consolidated with its smaller ship, is angling for prospective contract for about 100 ships from American Airlines. At least five producers have offered designs for this prospective contract. Douglas has been working hard on its peacetime version of its new XB-42, which never saw any action in this war, also with the American Airlines contract in mind.

Thus, from the standpoint of materials to be consumed during the immediate postwar years by the aviation industry there is not too much expected. There will be a tremendous drop in steel consumption by the aircraft construction industry and an upheaval of the specific product mix of the war years. During the first half of 1945, the industry consumed 221,231 tons of steel, more than 77,000 tons of which consisted of sheets and pipe and about 90,000 tons of which was in the form of bars. Estimates of annual consumption of steel by the aircraft industry during the immediate postwar years range from 150,000 net tons to 500,000 net tons. The 500,000 tons estimate was made by Marion Worthing in an unpublished manuscript entitled "Postwar Prospects of the Iron and Steel Industry," that was offered as testimony in the Iron and Steel Disposal Report prepared for the Senate Committee on Military Affairs. (See THE IRON AGE, June 21, 1945.) The more conservative estimate of 150,000 tons was made after an analysis of aircraft markets from data obtained by the writer. These estimates are shown in table IV.

The estimates show the anticipated shift in product demand from war to peace production. While new aircraft construction will require essentially the same products as during the war, mainly sheets, bars and pipe, considerably more emphasis will fall on ground facilities expansion, airports, and similar activities that take greater tonnages of such items as structural, concrete bars and plates. Thus, the steel demand pattern set up by the war for aviation will be altered considerably during the immediate postwar years.

Farm Equipment

WHEN the War Production Board pulled all stops on farm equipment production effective July 1, 1945, it told the industry that in the next 12 months its output should be increased 30 pct above the levels of the past 12. By the end of October it was apparent that the farm equipment manufacturers not only had failed to gain speed but were lagging behind their 1944-45 output. Dollar totals for the July-October, 1945 period were only $199,663,256 compared to $208,621,984 in the same months of 1944.

The difficulty did not lie in lack of willingness on the part of the manufacturers, lack of demand from their customers, nor lack of assistance from WPB which got along swimmingly with the industry. Rather, it was a combination of troubles at the root of which was manpower shortage in the farm equipment plants and in the plants of suppliers. Sporadic strikes hit hard some of the larger plants in the industry and those of key suppliers.

Even more than in the automobile industry, the production train of farm equipment manufacture lies in integration of the assembly line with flow of a host of parts and components from other manufacturers. If any one of these pieces is hard to obtain, the whole manufacturing process slows down.

Lack of gray iron and malleable castings has backfired in the face of the farm equipment builders. Most of them have some foundry capacity in their own plants, but the total is sufficient to maintain production at only a moderate speed rather than the dizzy pace which the industry has been hitting. One medium sized farm equipment firm, in an attempt to bolster its own foundry output, has a staff of expediters badgering some 82 commercial foundries with which it has placed orders. The industry is jabbed from day to day with varying deficits in such items as chain, cotton duck, lumber, tires, magnetos, radiators, quick drying paint, transmissions, wheels and rims, and nearly everything else except ingenuity. Just as during the war farm equipment needs ran head on into the tank program, today it is in constant conflict with efforts of the automobile industry to get into production.

Compared to the reconversion labors of the automobile builders, however, the farm equipment firms are suffering no pain. Although farm equipment talent and capital were drafted to build and operate new ordnance plants, and track type tractors put on an olive drab uniform, farm equipment kept out of 1-A because of its essentiality to food production. The American farmer had to give up to lend-lease considerable new equipment he wanted himself, but from the manufacturer's standpoint wartime production totals were the biggest in history.

Farm machinery production schedules were laid out by War Production Board for the production year from July 1, 1943 to June 30, 1944 on the basis of production of $671 million worth of equipment; for the 1944-45 season, $715 million was produced; and

for 1943-44, $596 million. That was not the whole story for the manufacturers, for they also were producing track laying tractors which in the calendar year 1944 reached a total of about $300 million. The complete story reflecting utilization of farm equipment manufacturing facilities can be deduced from the following calendar year totals which include track laying tractors:

1937	$524,419,953	1941	$653,228,565
1938	444,236,709	1942	646,969,485
1939	415,904,030	1943	613,675,125
1940	496,985,530	1944	1,080,902,464

With the war over, and the vast military demand for track laying tractors ended, production should fall into its normal pattern again. The high rate of production in 1940 compared to present levels will be particularly important to the industry in its procurement of steel. Steel manufacturers, with far more orders than they can handle, have instituted a rationing system among all their customers by which each is assigned a quota in proportion to his prewar requirement, often based on the year 1940. In this respect, the farm equipment industry is sitting very well indeed in comparison to other consuming lines whose prewar requirements were relatively small in proportion to their ability to absorb steel now.

To some extent, the industry, which had its cake during the war, can also eat it during the postwar years. The normal trend of farm equipment sales bears a close relationship to cash farm income, which was about $19 billion in 1943, $20 billion in 1944 and about $17 billion in 1945 compared to an average of $8.5 billion in the period 1935-39. Even if farm income hits the down grade, as is generally conceded, there is $12 billion savings in the sugar bowl, according to the Committee for Economic Development. In a survey conducted by members of the Midwest Farm Paper Unit, Inc., from 25 to 30 pct of the farmers in the heaviest tractor using states indicated that they would buy a new tractor within one year, if available. Moreover, as long as the away-from-the-farm trend (5 million people since 1940) continues, calloused hands will be replaced with mechanical equipment.

Design trends show clearly the demand for increased automaticity, effortless operation, and reduction of number of operators required on new equipment. Tractor manufacturers are waving wildly photographs of 14 year old girls driving tractors. While it perhaps isn't as easy as all that, improved steering mechanisms and use of hydraulic controls instead of muscles to place and hold tractor mounted and drawn implements in the desired position typify the trend. Where the combined harvester-thresher was formerly a ponderous affair requiring the services of two or three men, smaller new models roll along behind faster tractors with no attendants other than the tractor driver. Self-propelled machines even eliminate the tractor. Where bailing formerly was a multiple crew operation involving carrying the hay or straw to a stationary baler, in a few years most baling will be handled by pickup balers drawn behind a tractor, taking hay or straw from the windrow. And the bales will be scooped up onto a truck, instead of manually lifted, by a fork-conveyor device attached to the truck itself. This simplification and combination of operations shows all through the new farm machinery models. Besides, entirely new machines, such as the cotton picker, now ready for commercial production, may invade other fields.

Despite the hungry market, the climate is far less favorable for new manufacturers than after the last war when every shop that could find engines and wheels went into the tractor business. Crops, soil conditions, and topography present widely varied farming conditions, and leaders in the industry have given up attempting to market one machine which will do a fair job everywhere. Efforts are concentrated upon developing specialized machines tailored for a particular crop, use, and operating condition which will exclude any "will-fit" competition. The tractor and each of the principal implements must be built in several sizes to fit farming operations ranging from the 40 acre farm to the vast ranches of the Far West. Though the farmer may pay slightly more for equipment to fit his particular need, its increased efficiency is counted on to more than overcome the extra cost involved. International Harvester Co., largest manufacturer in the field, last fall displayed 32 production and three experimental tractor models and 49 production and 65 experimental machines other than tractors, not including combinations. Nearly every manufacturer has a stake in developing small sized equipment for farms of 40 acres or less, which constitute nearly 60 pct of the nation's total number, and which heretofore have been the least mechanized.

Several firms from other fields have indicated their intention to nibble fragments off the farm equipment market even if they cannot gobble the whole. Graham-Paige, who will produce at Willow Run, so far is the sole candidate to join the Ford-Ferguson group as a new marketer of a full line of machines. But if there are raids upon the farm machinery field by outside manufacturers, the farm equipment firms may do a little branching out themselves. International Harvester, for instance, is said to be working on a program under which expanded farm machinery production capacity will constitute only about one-quarter of the firm's total business.

Containers

CAN manufacturers and food packers are getting ready for what they believe will be the biggest boom in their history. In 1946, however, food packs will be somewhat limited because certain processes in the steel industry that are allied to the manufacture of tinplate are of limited capacity and tin supplies in this country are insufficient to permit a large scale boost in tinplate output.

General line and certain sanitary cans were one of the first civilian casualties of the war. Tinplate production for civilian use was restricted at every turn, tin coatings on sheets were reduced in thickness, and certain types of packaged goods were limited to substitute materials such as glass, bonderized plate, and lacquered plate. This is about over now because those restrictions are gradually being eliminated and can makers are using tinplate for greater varieties of cans and packs.

Government has been pessimistic during the war of the tin supplies, and rightly so. At the start of the war tin imports were shut off except for dribbles from South America and the Belgian Congo, and existing supplies had to last through a period of stress of unknown duration. Now, however, industry observers feel that the time has come for government to move out and let industry go back to normal procedures. Tin controls as they now exist forbid the purchase of tin

through industrial channels, but it is felt by some authorities that if the industry were permitted to buy for itself some 30,000 tons of tin could be added to present stocks without difficulty. Despite this, tin purchases continue to be a function of the Metals Reserve Corp., and government estimates indicate that tin supplies are sufficient for only 12 months' consumption at present rates.

Can manufacturers are now looking to peacetime business and laying plans for a greatly expanded industry. Can making facilities are being moved closer to tinplate sources and closer to packing companies. Continental Can Co. has announced the construction of plants near the Weirton Steel Co., at Weirton, W. Va., adjacent to the Carnegie-Illinois Steel Corp.'s Irvin Works, Pittsburgh, and near a tin mill in the Chicago area. Also, plans have been announced for plants in Florida and California. American Can Co. announced recently the plans for a $6 million plant in Baltimore and for a large plant in California. Proximity to steel mills will inevitably affect the cost of tinplate to the can maker, reduce delivery costs, and make for simpler handling and less packaging of tinplate for delivery.

Electrolytic tinplate was a lifesaver during the war and will be a big factor in the canning industry during the coming peacetime years. At present many electrolytic tinning lines are inactive, but this is temporary. Can makers feel that the cost of the electrolytic plate is too high and the differentials of 50c a base box between this and hot dipped plate is insufficient to warrant the use of the thinner coated stock which requires special handling. Further, soldering on body lines at high speeds still causes some difficulties. To overcome these faults and make the cost attractive to the can maker is a job for the steel industry, but it is certain that technological advances in this field will result in price reductions on the electrolytically coated sheet and many of the mechanical difficulties will be worked out.

Resumption of general line or dry pack canning is expected to require much if not all of the electrolytic tinplate capacity. Displacement of hot dipped in the wet or processed food packs must await the results of studies now underway on corrosion resistance of this type of plate. Electrolytic plate is established, however, evidenced by the fact that in 1944 about 14,000,000 base boxes of the 0.5 lb plate were produced—some 25 pct of the total tinplate production.

Can production for civilian use fell from about 17 billion units in 1939 to some 8 billion units in 1944, during which time glass units for civilian use rose from 7 billion to 13 billion. The big five, American, Continental, Crown, National and Heekin, will lead the way to recover this business and the smaller companies will follow along. As soon as all limitations are off, can makers and packers will go after the market on all fronts.

It is expected that tinplate consumption during 1946 will total between 2.4 million and 3.5 million net tons. This, of course, includes both hot dipped and electrolytically coated plate as well as black and terne plate. Since tinplate is one of the steel industry's best products from a profit standpoint, it seems certain that lack of steel will be an insignificant factor in the limitation of tinplate production. However, limited pickling capacity, annealing capacity, and the capacities of certain other processing functions may be a restricting factor in tinplate output.

Another major phase of the container industry is the steel shipping container or drum. This business, now mainly a function of the steel industry since the bulk of the drum producing capacity was acquired by steel companies, got a terrific push during the war. Demands for the shipment of gasoline, paints, foods, solvents, radio and radar parts, and a thousand and one other items needed by the armed forces, skyrocketed this business to unprecedented heights. Total drum production in 1945 is estimated to be about 19 million units, while unfilled orders at the end of the year have been estimated to total about 4 million units.

In converting drums to sheet steel tonnages, many difficulties arise. However, a leading authority in the field stated within the past two weeks that there is an immediate demand for 800,000 tons of sheets by the steel shipping container industry. This tonnage is better than that of the best war year, 1944.

Two developments will be forthcoming during 1946 that should increase the use of steel drums. The first

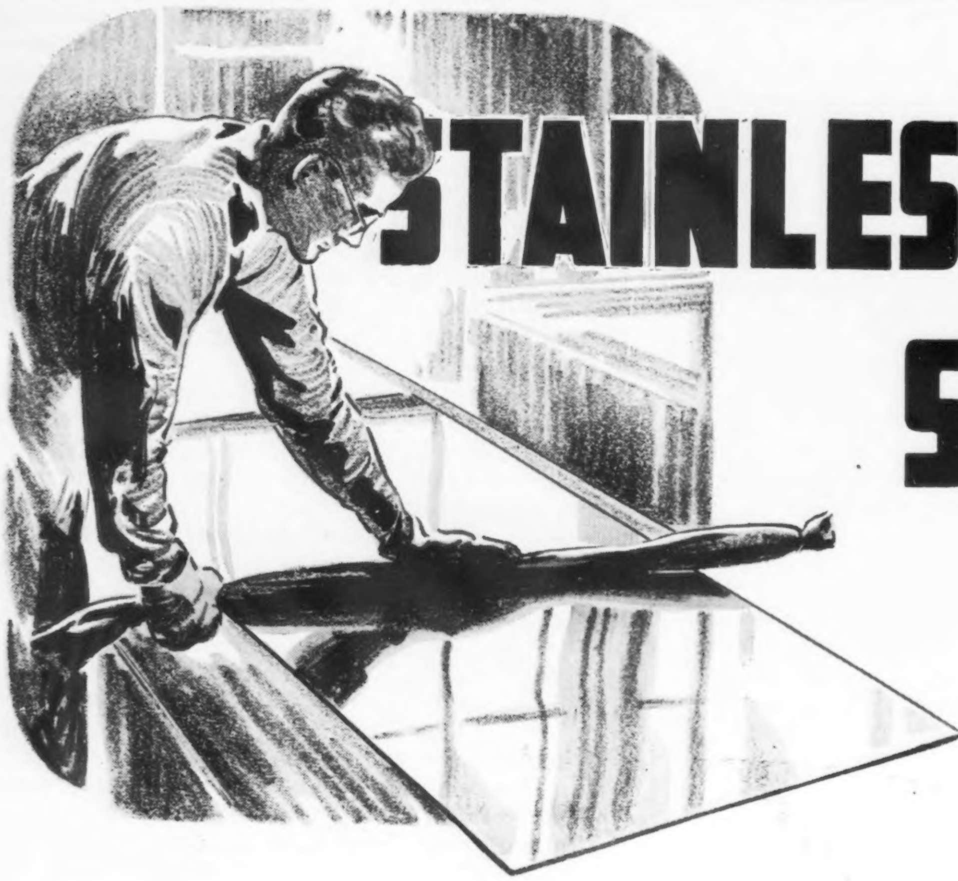
(CONTINUED ON PAGE 288G)

TABLE V

Estimated 1946 Steel Consumption by the Container Industry

Product	Iron and Steel Plants Disposal Report to Senate Committee on Military Affairs			J. A. Krug's Report, "Production"	The Iron Age
TOTAL*	3,900,000	3,500,000	5,000,000	4,133,000	4,000,000
Rails	....	....	....	....	....
Rail accessories	....	....	....	....	....
Structural and piling	27,500	24,300	35,000	29,300	28,400
Plates	260,000	230,000	330,000	274,000	264,000
Bars, carbon and alloy	20,600	18,500	26,400	22,000	21,100
Concrete reinforcing bars	....	....	....	....	....
Black, terne and tinplate	2,760,000	2,480,000	3,542,000	2,921,000	2,833,600
Galvanized sheets	40,900	36,700	52,500	43,500	42,000
Hot and cold-rolled sheets	566,500	510,000	728,000	606,000	582,000
Hot and cold-rolled strip	128,000	115,000	165,000	135,500	132,000
Pipe and tubing	25,000	21,300	30,400	25,400	24,300
Wire and wire products	51,000	45,700	64,000	54,300	51,200
Other finished products	20,500	18,500	26,400	22,000	21,100

* Only total estimates were made by accredited sources. Product breakdown was made from these total estimates on the basis of past industry performance.



STAINLESS STEEL

By T. W. LIPPERT
Editor

Returning from war anonymity, stainless steel is in such insistent demand that 1946 production should establish a new record. Producers are more market-minded and have aggressive designs on outlets hitherto dominated by aluminum. And there will be new requirements for gas-turbines.

ALWAYS the object of a certain amount of superficial favoritism, stainless steel is rapidly becoming the darling of the industry, the protector of existing markets against competitive raids and the spearhead and prober of new outlets.

Until about the middle of last year wrought stainless, intimately integrated as it was with war production, had a product distribution of about 50 pct into aircraft, 20 pct into Navy and Maritime construction, 15 pct into Army ordnance and equipment, and 15 pct into all other classifications, of which not more than 2 or 3 pct ended up in civilian consumer goods. V-J Day brought an immediate drastic reshuffling of the distribution pattern, both as to products and as to analyses, as a reflection of the headlong consumer rush to shift back to an approximate peacetime distribution of some 35 pct into automotive work, 15 pct into food-handling, 20 pct into transportation, and the remainder into other civilian goods, with a minor mop-up tonnage directed to military items. The virtually complete cutback in military aircraft threw short-time relatively excess bar and rod capacity onto the industry, thousands of tons of welding rod for instance; and a return of peak demands for automotive trim and food-handling equipment threw an insupportable load onto the sheet and strip capacities, the magnitudes of which are shown only in part by table II.

As for gross activity of the industry in the amphibical year of 1945, table I indicates establishment of a new record of some 548,000 ingot tons, which is about 8 pct above the previous 1944 peak. In detail, the table also shows a sharp pickup in demand for the 18-8 analysis, reflecting therein deliveries to a variety of consumer products of which food-handling was the major component. The impact of the resurgent automobile industry shows up in returning strength of the 16 to 18 pct straight-chrome analyses, a strength which should re-establish this particular grade to its dominant prewar status by early next year.

It has been the mounting demands for sheet and strip, particularly polished sheet and strip, that have been exceptionally troublesome to producing mills, what with these items in almost negligible demand during the war years. Most manufacturers have rushed through orders for additional polishing equipment, but meanwhile some producers are so out of balance that nothing better than early 1947 delivery is promised for new polished sheet orders. This is an extreme and overly-distorted situation which delivery of a few polishing machines can quickly alter to a more sensible position.

THE casting industry, as shown in table I, did not undergo such swift upheaval in demand at war's end as did rolled steel. Distribution of total 1945 tonnages pretty well follow war patterns although the 1945 output of 18-8 analysis does show a rise, which

probably reflects some fourth-quarter return to peacetime products. About two thirds of casting production falls into the heat-resisting classification, the remainder being corrosion-resisting with just a dabble of wear-resisting analyses.

For the year 1945, the industry produced 18.105 net tons of finished castings, which was about 3 pct under the 1944 level and some 18 pct under the all-time peak established by the industry in 1943. This activity represented a gross business volume in the neighborhood of $26 million. The period of war-plant expansion called for an unbroken 3-yr advance in casting output and since early 1944 replacement castings has kept activity considerably above the projected peacetime trend, despite the drop in new construction. New orders are already in sufficient volume to cushion 1946 production to a relatively easy decline to a position in conformity with the long-term consuming pattern.

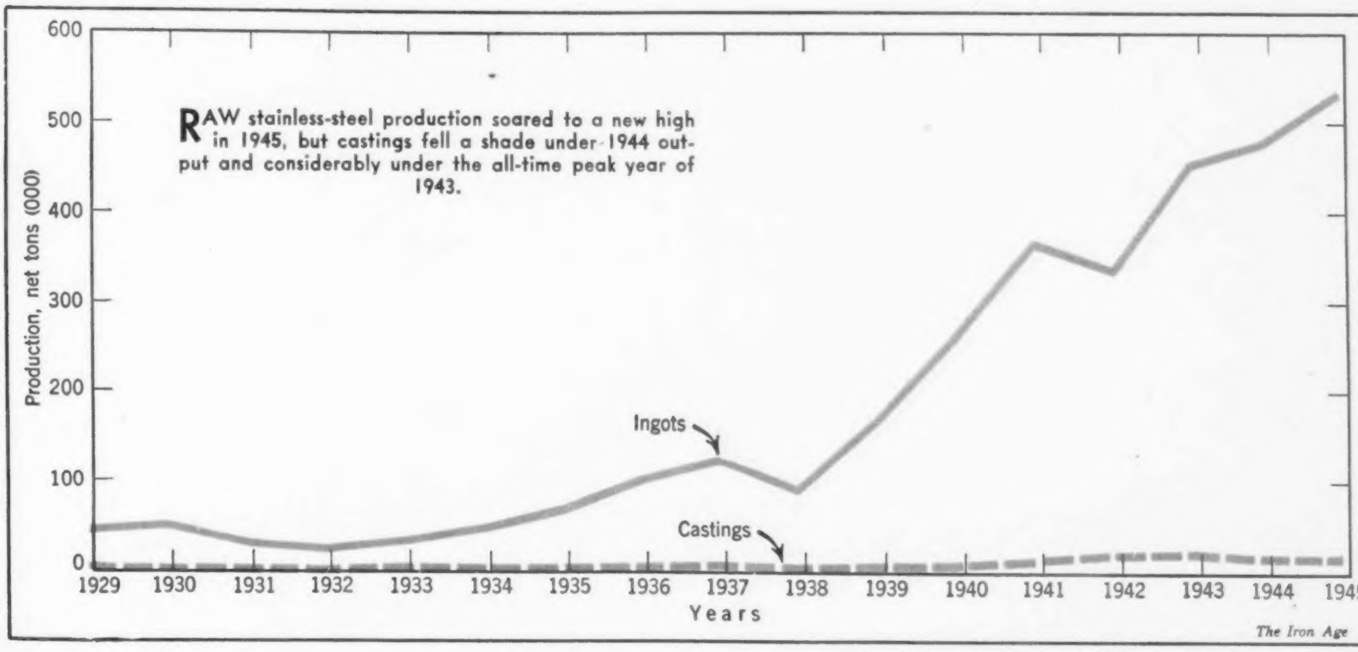
THE reconversion period, a distorted interval having no trend significance, has served to juice-up the position of flat roll stainless products and to minimize the long-term dominance of bars in a peacetime economy. Bar production was heavy for war goods, and peacetime bar consumers have not entered the market in full volume. Just a reversal of this situation has been the rule for flat-rolled products.

At year's end all new production facilities seem to be directed toward correcting the temporary unbalance in flat-rolled products. Bopp Steel Co. and McClouth Steel Corp. are both planning heavier stainless strip output, and will probably buy their ingots from Rotary Electric Steel Co. Eastern Stainless Steel Co., a relative newcomer attracting considerable attention in the big time, has an order in for a new cold-reducing unit, and will probably have refining facilities underway by late 1946. Washington Stainless Steel Co. should have its Sendzimer mill in operation and delivering wide sheet by next summer. This unit is expected to roll 36 in. wide and 0.004-in. gage, a width and gage which always has been in short supply. And Sharon Steel Corp. is buying more electric furnace capacity for stainless.

Stainless producers and fabricators are going to make a determined effort to invade the cooking utensil field, an area that has been meticulously cultivated by aluminum fabricators. By February there should be at least three new lines of excellently styled, high-grade stainless-steel utensils on the market, one of them being fabricated of double-armored Pluramelt. Several new free-machining stainless steels are all ready to be marketer, and one of them will probably be a high-copper stainless similar to the English cypritic steel described in THE IRON AGE, March 12, 1940. In experimental heats 4 or 5 pct copper in stainless has given a product of excellent free-drilling characteristics with no loss in other desirable properties. Two new age-hardenable alloys in the Rustless and U. S. Steel Corp. shops are in the advanced experimental stage. These two alloys were developed primarily for the aircraft industry to make available to design engineers a material equally strong in tension and compression, perhaps as high as 200,000 psi. Another company is actively engaged in developing a series of steels having the formability of mild steels, a development which would encourage use in those many fabricating shops not familiar with the specialized know-how required by stainless.

THE durability and appearance of stainless steel are the two properties that have never been as fully exploited as they might have been. That the ultimate consumer has a high regard for the metal is amply proved by the Gallup-type survey detailed on p.—; or, by the *American Home* survey of a few years ago which showed housewifes willing to pay 20 pct more for stainless refrigerator shelves.

However, in order to probe thinking among the fabricators of consumer (and durable) products, THE IRON AGE in December surveyed by mail all prewar users of stainless, some 6000 in all. Of the users so questioned, almost 500 were either out of business or unknown at the prewar mailing address, but close to 2000 answered. The survey, of course, being couched in generalities, was subject to all the ambiguities of such surveys, not the least of which is congenital optimism and the belief that more of everything will



RAW stainless-steel production soared to a new high in 1945, but castings fell a shade under 1944 output and considerably under the all-time peak year of 1943.

be used. But, at least some degree of insight was gained as to what may be the qualitative (not quantitative) reception of stainless in the postwar period by designers and fabricators.

With the survey going exclusively to users of stainless, it is not surprising to note that 79 pct expect to use more stainless in the postwar period. But, 18 pct expect to use less stainless. Of both groups, 32 pct expect to use more aluminum, 10 pct expect to use less aluminum, 7 pct look for the use of greater amounts of magnesium in their products, and 4 pct expect to use less magnesium. Unexpected was the 33 pct of all those questionnaired which look for the use of more straight-carbon steel, whereas 23 pct looked for the use relatively of less carbon steel. The question was then asked as to whether the sum total of wartime production experience resulted in any knowledge which might influence the use of more stainless steel: 51 pct of the entire group thought that such experience was of a nature of encourage the use of more stainless, but 46 pct were of the opinion that wartime experience in itself had no bearing on any postwar decision to use more or less stainless steel in their products.

Of course, many of the users reported that proportionally no more stainless would be used in their products than in the prewar period. Of these indicating intention to adopt more stainless, apparently the copper alloys and copper-nickel alloys were going to suffer somewhat. A few users mentioned that the recent decrease in the price of stainless steel welding electrodes may well encourage the use of stainless for pieces of equipment which formerly were made of carbon steel.

TABLE I

Production of Stainless and Heat-Resisting Ingots and Castings in the United States (1929-1945). By Analysis Groups.*

(In Net Tons)

Year	18 Pct Cr and 8 Pct Ni	16 Pct Cr and 2 Pct Ni	25 Pct Cr and 12 Pct Ni	12 to 14 Pct Cr	16 to 18 Pct Cr	18 to 30 Pct Cr	All Others (Cr and Cr-Ni)**	Not Allocated	Total
INGOTS									
1929 §	21,074	...	...	14,552	10,127	...	2,950	187	48,890
1930 §	32,867	...	...	8,821	7,995	...	4,792	474	54,949
1931 §	14,740	...	...	5,397	7,483	...	3,438	622	31,680
1932 §	9,209	...	...	4,900	6,751	...	3,312	660	24,832
1933 §	19,620	...	...	7,401	4,969	...	5,262	...	37,252
1934 §	24,818	...	...	9,470	8,787	...	8,832	...	51,907
1935 §	30,114	...	3,827	15,220	14,101	1,606	6,713	...	71,581
1936 §	45,800	...	5,530	25,430	21,478	1,022	2,900	...	102,160
1937 §	55,011	...	6,423	30,186	28,500	1,615	5,107	...	126,842
1938 †	43,129	...	...	13,429	16,454	...	27,692	...	100,704
1939 ‡	76,332	...	7,342	15,135	35,506	937	38,084	...	173,336
1940 ‡	118,663	2,370	10,495	20,375	55,476	1,713	55,783	...	264,875
1941 †	163,983	...	...	62,993	101,776	...	65,552	...	394,304
1942 †	202,439	...	...	62,568	23,211	...	73,022	...	361,240
1943 †	257,010	...	...	98,997	21,662	...	107,199	...	484,868
1944 †	299,065	...	...	75,065	47,433	...	84,615	...	506,178
1945 †	329,580	3,350	3,964	75,248	79,705	4,336	51,332	...	547,515
CASTINGS									
1929 §	310	...	...	18	156	...	3,326	1,392	5,202
1930 §	271	...	...	15	96	...	2,930	1,009	4,321
1931 §	225	...	...	29	192	...	2,264	511	3,221
1932 §	384	...	...	23	237	...	1,257	285	2,186
1933 §	352	...	...	36	225	...	2,126	54	2,793
1934 §	387	...	...	86	164	...	3,036	201	3,874
1935 §	446	...	760	113	288	88	2,293	83	4,071
1936 §	874	...	1,280	96	295	86	3,270	...	5,901
1937 §	996	...	1,430	108	332	62	3,902	...	6,830
1938 §	578	...	612	276	261	64	2,239	...	4,030
1939 ‡	948	...	1,193	451	325	48	2,725	...	6,090
1940 ‡	1,402	112	2,712	408	401	23	4,134	...	8,700
1941 ‡‡	2,660	205	5,365	327	...	51	7,083	...	15,697
1942 ‡‡	2,835	273	7,578	401	...	33	9,635	...	20,755
1943 ‡‡	2,781	423	6,781	816	...	65	11,120	...	21,986
1944 ‡‡	2,767	330	4,692	614	...	58	10,220	...	18,681
1945 ‡‡	4,000	165	4,350	780	...	80	8,730	...	18,105

† American Iron and Steel Institute figures adjusted by THE IRON AGE to include low-alloy valve steels.
‡ Converted from THE IRON AGE consumption survey, adjusted to include exports.
§ Producer surveys made by THE IRON AGE.
‡‡ Alloy Casting Institute figures.

* Analyses groups are approximate; in several classifications each element may vary as much as ± 2 pct from the range shown, or may contain other elements such as molybdenum. In the case of *castings* a sizeable percentage of the tonnage in any of the straight-chromium classifications may contain from 0 to several percent nickel.

** This catch-all contains many analyses groups: In *steel* ingots there are included such analyses as 4 to 6 pct Cr, 25 Cr-20 Ni, 5 to 8 pct Cr. 15 Cr-35 Ni, etc.: for *castings*, by far the three most prominent are the important heat-resisting analyses 33-36 Ni and 15-17 Cr; the popular analyses in the range 60 + Ni and 10-17 Cr; and the slightly less important analysis group 30-40 Ni and 18-20 Cr. In 1945 the 35 Ni-15 Cr and 60 Ni-12 Cr groups accounted for 4445 tons and 865 tons respectively.

TABLE II

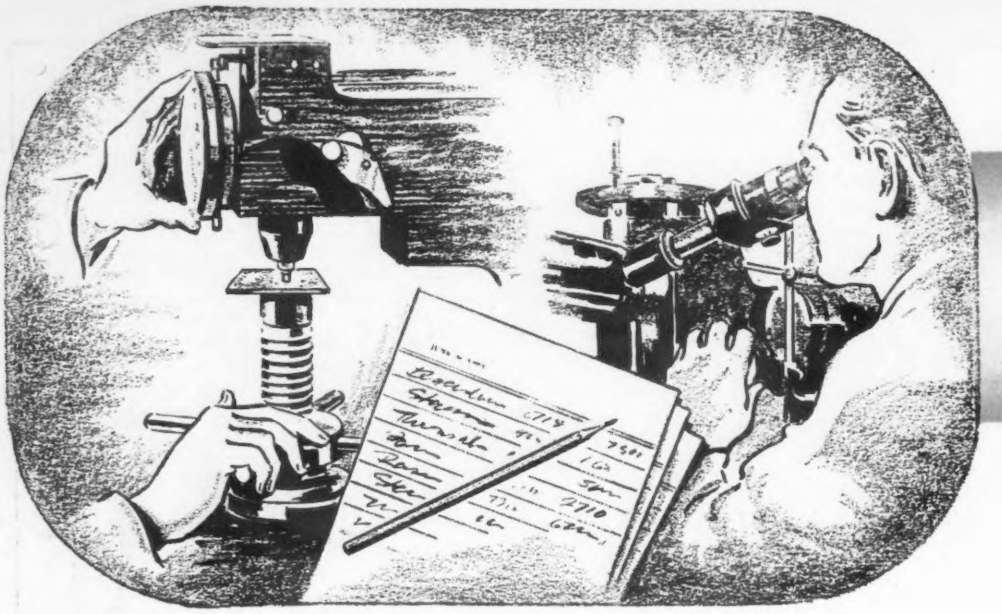
Production of Corrosion and Heat-Resisting Steels (1939-1945). Product and Analysis Breakdown

(In Net Tons)

Type of Finished Steel	Year	Analysis Groups, Percent Composition *: 18 Pct Cr and 8 Pct Ni	16 Pct Cr and 2 Pct Ni	25 Pct Cr and 12 Pct Ni	12 Pct to 14 Pct Cr	16 Pct to 18 Pct Cr	18 Pct to 30 Pct Cr	All Others (Cr and Cr+Ni)	Total Output, All Analyses
Sheets (hot and cold-rolled)	1939	13,162	......	105	622	1,705	22	7,116	22,732
	1940	19,347	826	666	673	2,890	373	7,965	32,740
	1941	......	......	......	......	......	......	......	96,272
	1942	......	......	......	......	......	......	......	80,136
	1943	......	......	......	......	......	......	......	110,047
	1944	......	......	......	......	......	......	......	128,612
	1945	......	......	......	......	......	......	......	124,600
Bars and heavy rods	1939	3,735	......	952	4,505	3,421	66	12,435	25,114
	1940	5,055	53	1,339	6,264	4,999	80	17,386	35,176
	1941	......	......	......	......	......	......	......	67,683
	1942	......	......	......	......	......	......	......	97,433
	1943	......	......	......	......	......	......	......	94,665
	1944	......	......	......	......	......	......	......	78,077
	1945	......	......	......	......	......	......	......	95,770
Strip (hot and cold-rolled)	1939	25,769	......	1,381	479	11,761	17	1,910	41,317
	1940	34,476	363	1,863	1,847	20,612	87	3,832	63,080
	1941	......	......	......	......	......	......	......	42,055
	1942	......	......	......	......	......	......	......	24,389
	1943	......	......	......	......	......	......	......	28,298
	1944	......	......	......	......	......	......	......	32,080
	1945	......	......	......	......	......	......	......	102,068
Tubular goods	1939	1,282	......	34	22	102	363	842	2,645
	1940	3,969	......	40	280	96	207	2,204	6,796
	1941	......	......	......	......	......	......	......	8,182
	1942	......	......	......	......	......	......	......	14,324
	1943	......	......	......	......	......	......	......	10,764
	1944	......	......	......	......	......	......	......	14,425
	1945	......	......	......	......	......	......	......	16,428
Plates and shapes	1939	924	......	94	88	165	22	777	2,070
	1940	3,152	......	108	95	383	141	669	4,548
	1941	......	......	......	......	......	......	......	14,467
	1942	......	......	......	......	......	......	......	16,110
	1943	......	......	......	......	......	......	......	11,537
	1944	......	......	......	......	......	......	......	31,934
	1945	......	......	......	......	......	......	......	16,130
Wire and light rods	1939	2,157	......	55	1,429	4,827	50	231	8,749
	1940	5,762	39	220	1,526	4,977	79	1,892	14,495
	1941	......	......	......	......	......	......	......	22,243
	1942	......	......	......	......	......	......	......	31,553
	1943	......	......	......	......	......	......	......	36,729
	1944	......	......	......	......	......	......	......	29,296
	1945	......	......	......	......	......	......	......	27,042
Forgings and semifinished	1939	297	......	1,931	2,239	33	41	301	4,842
	1940	1,098	174	2,208	1,825	105	85	303	5,798
	1941	......	......	......	......	......	......	......	16,938
	1942	......	......	......	......	......	......	......	14,242
	1943	......	......	......	......	......	......	......	20,910
	1944	......	......	......	......	......	......	......	18,091
	1945	......	......	......	......	......	......	......	20,246
Total (by analysis)	1939	47,326	......	4,552	9,384	22,014	581	23,612	107,469
	1940	72,859	1,455	6,444	12,510	34,062	1,052	34,251	162,633
	1941	......	......	......	......	......	......	......	267,840
	1942	......	......	......	......	......	......	......	278,187
	1943	......	......	......	......	......	......	......	312,950
	1944	......	......	......	......	......	......	......	332,515
	1945	......	......	......	......	......	......	......	402,284

GRAND TOTAL, all finished steels, all analyses—for 1939 = 107,469 net tons.‡
—for 1940 = 162,633 net tons.‡
—for 1941 = 267,840 net tons.†
—for 1942 = 278,187 net tons.†
—for 1943 = 312,950 net tons.†
—for 1944 = 332,515 net tons.†
—for 1945 = 402,284 net tons.†

‡ From THE IRON AGE consumption survey, with exports included in "all other" classifications.
* Analysis groups are approximate; in several classifications each element may vary as much as ±2 per cent from the range shown, or may include small percentages of other elements such as molybdenum, columbium, titanium, etc.
† American Iron & Steel Institute figures adjusted by THE IRON AGE, and including low-alloy valve steels.



By J. Z. BRIGGS
Crucible Steel Co. of America, New York

THE change in 1945 from production for two wars, with its accompanying shortages of most metals, to reconversion to peace-time needs with shortages of only a few metals has been unprecedented. Although all the war-time developments have not yet been disclosed, metallurgy has come a long way since 1941, although it is too soon for a reliable prediction as to the future of the war-time developments. Some, such as the high-temperature alloys for gas turbines and the high-strength aluminum alloys, will undoubtedly find wide application. Others, such as the NE alloy steels and the low-tin solders, may or may not be retained.

An increasing amount of alloy steel will probably be used with a greater percentage of the electric-furnace steels than before the war. There has been considerable speculation as to whether the war-bred NE steels would be retained in peace time. Their performance on the whole was excellent although there were special applications where they did not equal the higher alloy SAE steels. However, there seems to be a trend back to the SAE steels, due in part perhaps to the resurrection of old specifications and blueprints. In any case, a few of the NE grades, probably some of the NE 8600 and 8700 series, will certainly continue to be used. In spite of the desirable features of the NE grades from the standpoint of continued utilization of alloy scrap, it should be remembered that the SAE steels have many years of satisfactory service in civilian goods while the NE steels have but a few years of experience which was limited by war time scarcities. It may be that the recent increase in the number of "H" steels with controlled hardenability will do much to further the conception of interchangeability of the low-alloy steels for the average application.

In recent years, undue emphasis has been placed on the actual hardness of the steel rather than on its structure and mechanical properties. There is an increasing realization that for optimum mechanical properties the steel should contain practically 100 pct martensite before it is tempered. The presence of ferrite or tempered pearlite or bainite may not affect the hardness of the tempered steel but does lead to lower yield-strength ratios, lower toughness and lower ductility. In low-hardenability steels, there is not much difference between the hardenability based on 50 pct martensite and that based on 100 pct martensite. However, in steels with high hardenability, the difference may be appreciable. As a practical example, sizes up to about $1\frac{1}{2}$ in. diam of steels such as NE 8640 and AISI 4140, can be hardened in oil if 50 pct bainite and pearlite can be tolerated. If full martensite is desired, sections should not exceed about $\frac{1}{2}$ in. In many cases, the presence of products other than martensite is not deleterious, but for severe service, steels should be used only in sections that will harden to 100 pct martensite.

The work on hardenability has helped to increase knowledge of the effect of individual alloying elements in steels. While none of the proposed methods of calculating hardenability is more than an educated guess which must be confirmed by actual tests, the Grossman principle of multiplication is still the most popular. Even though new and modified factors have been proposed, they have in general been based on the greater effectiveness of the first small addition of an element. However, some recent work has indicated that Grossman's method may have to be modified for steels containing appreciable amounts of a single element or for complex alloy steels. This interdependence of the multiplying factors does not invalidate the multiplication principle but does complicate calculation.

A different method has been proposed based on alloy addition increments rather than on the multiplying effect. Although the two methods have different bases, both seem to give reasonably reliable results. The divergence is probably not so much the result of the method of calculation as it is of segregation, errors in analysis, heat treatment and hardness testing. The accuracy of hardness testing may not be much greater in actual commercial testing than the accuracy of calculation. Microsegregation has been blamed for many variable results but it has been difficult to determine accurately the extent of the microsegregation. Recent work has shown that a modified spectrographic analysis can be used to determine quantitatively the amount of microsegregation. A small blast of dried air blown across the spark gap enables the determination of carbon content as well as the alloying elements generally determined spectrographically. When more results are available with this method, it should be possible to prove or disprove many of the theories based on segregation.

There has been an increasing application of S or

METALLURGY

A multiplicity of wartime developments in ferrous and nonferrous metallurgy is being integrated with peacetime production. Improved high-temperature alloys, high-strength aluminum alloys, new welding methods and surface treatments, and a variety of processing and fabricating innovations are only a few of the many improvements demanding attention.

TTT curves to commercial heat treating. Although many of these modified treatments were devised especially for the low alloy NE steels, it seems certain that they will be retained regardless of whether or not the NE steels are used. While the basic use of a timed or interrupted quench is not new, the scientific application of the TTT curves and the appreciation of the fast cooling rates of agitated hot salt baths are recent developments. These treatments have resulted in many cases in improved mechanical properties with decreased distortion and danger of cracking as compared with the conventional quench and temper.

TTT curves have now been published on some 190 analyses so there is no difficulty in obtaining the information for any of the common grades of steel. These curves have been applied not only to wrought steels but also to cast steels where heat treatment has received appreciably more attention lately. There is general agreement between the TTT curves for wrought and cast specimens of the same grade. The slight discrepancies have been attributed to inherent microsegregation. The most important difference appears to be in the martensite temperature which is consistently 50° to 100° F lower for cast than for wrought steels. On the whole, the difference between wrought and cast steels of the same grade are minor compared with the differences resulting from the normal variation in chemical composition.

Avoiding Cracks in Welding

Increasing attention has been paid to the welding of hardenable steels and the avoidance of cracks in the parent metal. Spot welding with controlled tempering in the welding machine is highly satisfactory but obviously is not applicable to other types of welding. However, where it can be used, the greatest improvement is noted with highly hardenable steels such as SAE 4340 where the shear strength can be more than doubled, the tensile strength almost tripled and the impact strength increased twelve times. It has long been appreciated that suitable preheating and postheating enable hardenable steels to be welded but such a procedure is slow and cumbersome. Moreover, it is hard to justify such a practice when some heats of a grade can be welded satisfactorily without precautions of this type.

Within the past year, some of the metallurgical factors, particularly in reference to SAE 4130 and NE 8630, have been clarified. In general, a coarse carbide structure is less crack sensitive than a fine carbide structure. A higher aluminum content decreases the crack sensitivity if the steel is annealed prior to normalizing because the aluminum promotes the formation of coarse carbides. This work enables the steel producer to supply sheets and tubes more satisfactory for welding. It is interesting to note that NE 8630 showed less cracking tendency than SAE 4130. Since the obtainable mechanical properties as well as the forming characteristics of these steels are similar, it is possible that NE 8630 will find a definite post war future in parts involving welding. Simultaneously, the recognition of the importance of hydrogen in parent metal cracking has led to the development of carbon and low-alloy steel electrodes with special low-hydrogen coatings.

The war time urgency of the turbo-supercharger and gas turbine program led to an intensified development of high strength high temperature alloys which should find many other applications in the future. The materials for the gas turbines have been one of the most serious problems in the production of jet planes since the efficiency depends upon the extremely high temperatures attained. Many standard corrosion and heat resisting alloys are used in certain parts of the plane, but of course the greatest interest is in the new alloys for the turbine proper which have elevated temperature properties far superior to any of the grades available at the start of the war.

The secrecy has been partially lifted on the jet-propulsion gas turbines made by General Electric. A modified, age-hardenable Inconel with about 75 pct nickel 14 chromium 0.6 aluminum 3 titanium and 6 pct iron is used for the combustion chambers while Timken alloy with 16 pct chromium 25 nickel 6 molybdenum and 0.08 pct carbon is used for the

turbine impellers. Vitallium with about 65 pct cobalt 20 chromium and 5 pct molybdenum is used for the turbine buckets of both the gas turbines and the turbo-superchargers. In view of its limited hot formability and difficult machinability, this alloy is generally precision cast. Full details of the properties of these and other high-temperature alloys developed for this program have not yet been released, but the Vitallium has over 65,000 psi tensile strength at 1500° F with 20 pct elongation. Alloys of this general type should find increasing application where high strength at elevated temperatures and abrasion resistance are required.

The finding of segregated graphite with resultant embrittlement near a welded joint in a steam pipe of carbon-molybdenum steel in 1943 was highly disturbing in view of the large amount of this grade used for power plants. When additional tests at various plants showed a widespread occurrence of graphitization, it became evident that this was a problem of immediate importance. Recently, segregated graphite has also been found along strain lines well removed from hot-upset or welded areas. To date, graphitization has been found only in steels known to have been deoxidized with relatively large amounts of aluminum (about 2 lb per ton). There seems to be no solution for severe segregated graphitization except to cut out the affected portion. If the graphitization is still in the preliminary stages, a normalize or a long stress relief at 1300° F should either redissolve the graphite or postpone further graphitization. However, the application of such treatments to existing applications has obvious disadvantages. At the present, the limitation of aluminum additions to ½ lb per ton (a McQuaid Ehn grain size of 1 to 5) seems to be the most popular means of preventing graphitization in wrought steels. The addition of small amounts of chromium is also being tried as an additional safeguard in some cases. In cast steels where the low aluminum addition may lead to unsoundness, there is interest in a nickel-chromium-molybdenum steel which is resistant to graphitization. Preheating and postheating by normalizing from just over the critical seem favored methods of hindering the formation of segregated graphite near welds.

Boiler Code Limits Cast Iron

Modern cast irons, particularly inoculated and alloy irons, have encountered difficulties due to specifications and codes based on old-fashioned cast iron. The ASME Boiler Code, for example, limits the use of cast iron to temperatures below 450° F although cast iron has actually been used successfully even at temperatures over 1000° F. The data on elevated temperature tensile strength and creep strength up to 1000° F are promising. Growth at temperature can be minimized by controlling the composition to prevent the separation of ferrite and to stabilize the pearlite. While cast iron cannot be substituted promiscuously for other materials, it is probable that the safe maximum working temperatures of the various codes will be increased to 600° to 750° F on the basis of laboratory data and many service results.

Although basic refractories have been improved, all basic openhearth steel furnaces are still in the experimental class. Basic refractories are five to ten times as expensive as silica refractories and weigh about 60 pct more. On the other hand, they last much longer due to their greater chemical inertness. It is questionable whether the higher cost will be offset by longer life and other advantages of the basic roofs such as the ability to hot patch suspended basic roofs, and the easier removal of slag from slag pockets. However, it is probable that basic roofs and port ends will be extensively used, especially on large furnaces, once design problems have been solved. The effect of all-basic furnaces with their higher attainable temperatures on openhearth metallurgy is unpredictable. Basic-lined ladles are stated to decrease the difficulty with phosphorus reversion and to be more efficient when sodium carbonate is used for ladle desulfurization.

The more scientific melting practice becomes, the more essential it is to know the exact temperature of the bath. Any method used must take into account the temperature heterogeneity of the bath, but until accurate temperature measurement methods are available, it is impossible even to establish the variation in temperature within the bath. Jones & Laughlin has had satisfactory results with a new radiation pyrometer. However, it has been shown that the emissivities of two heat-resistant alloys vary with the temperature and surface condition of the bath. Unless the condition of the surface of the molten bath is known, it is difficult to judge correctly what correction must be applied to optical pyrometer readings. An immersion thermocouple may be the simplest way of obtaining an accurate temperature reading. Rustless Iron & Steel has developed, on the basis of similar successful work in England, a quick-immersion platinum thermocouple which has been used quite satisfactorily in the electric furnace and which is now being adapted to openhearth work. An important part of the equipment is an electronic potentiometer which permits readings to be made in about 45 sec. Bath temperatures up to a maximum of 3200° F may be measured at a cost of about $1 per reading. There seems to be little question but that these methods will yield valuable savings through better temperature control as soon as they have become routine.

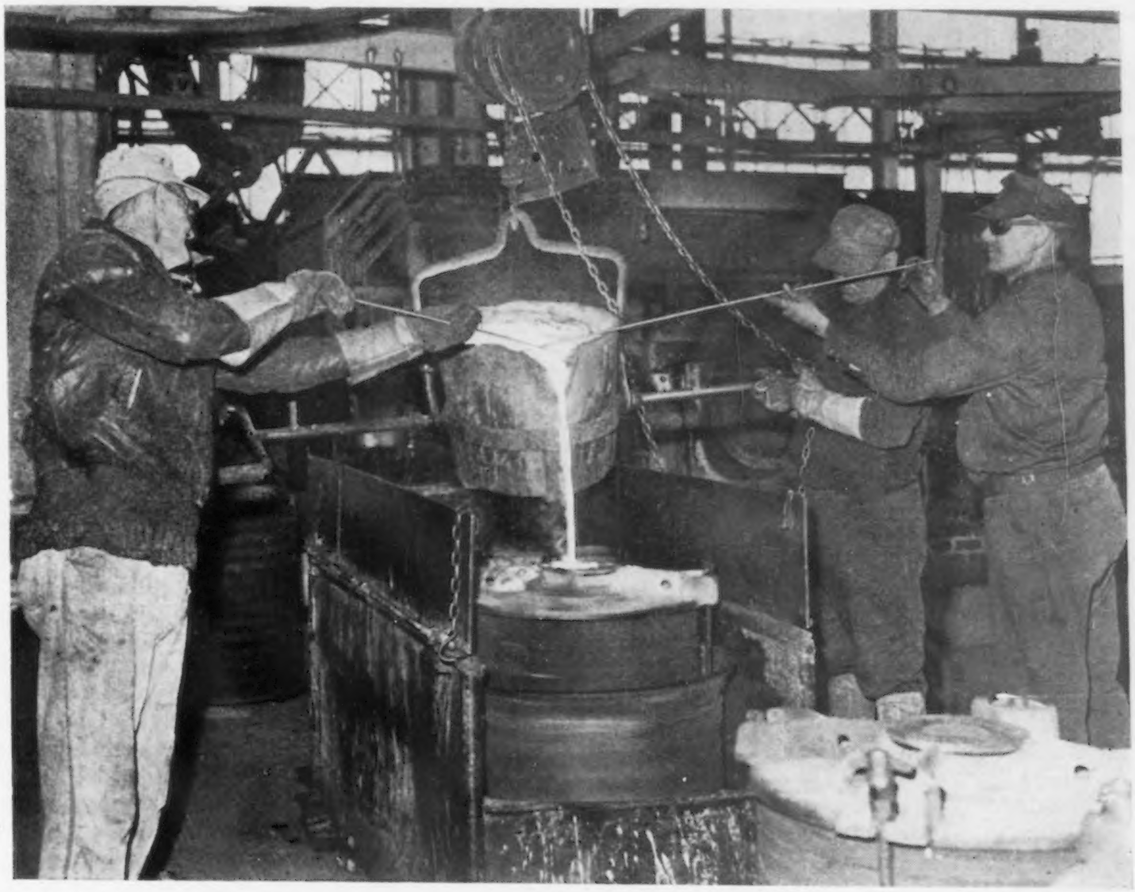
Sponge iron has been the subject of considerable popular discussion. The basic process is almost as old as the history of iron. The difficulty is not in the production of sponge iron, which can be made in almost any type of furnace with almost any type of reducing agent, but in producing it commercially and in deciding whether to use it for blast furnace charges or as a substitute for pig iron or scrap. The Bureau of Mines has continued development work in this field. Their two-diameter rotary kiln method of making granular sponge iron has been improved to yield a low sulfur iron suitable for steel making. Although the method is comparatively simple and the equipment relatively cheap, it has not yet been tried out on a sufficiently large scale for cost estimates to be made.

Two variations similar in principle to the Krupp-Renn process have been investigated; these yield an iron of very low silicon content and are expected to provide a means of making steel from high-phosphorus ores. Nevertheless, the only really commercial sponge iron plant is the Warren plant which started production recently. It will not answer fully the question as to the practicability of sponge iron

plants. Most of the sponge iron plants that have been discussed have been offered as a means of utilizing low-grade iron ore or a low-grade reducing agent.

The Warren plant is based on the reduction of high-grade magnetite concentrates with a reducing agent consisting principally of the hydrogen component of coke-oven gas. Their shipping product will not be a true sponge iron but will be dense briquets formed by compressing fine-size particles of sponge iron. The work to date has not been sufficient to give an accurate cost per ton. Although about 24 tons a day have been reduced in the preliminary work in this plant, the material could not be briquetted properly due to the present inadequate equipment. Of the first 2000 tons of iron ore concentrates charged, the product varied from totally unreduced to highly-reduced material with some 400 tons averaging over 75 pct metallic iron. However, a small amount of reasonably well briquetted sponge was used satisfactorily in the electric furnace as a substitute for low-alloy scrap in making specialty steels. The inadequate briquetting has delayed tests of this material in the openhearth. The increase in the amount of residual alloys in scrap will make any type of practically alloy-free charge of great interest to many steel makers.

An inevitable result of the return to consumer goods has been an increasing emphasis on appearance. Moreover, the occurrence of rust spots on bright plated parts during the longer than usual life necessitated by the war has been a shock to many users. A survey carried out on the condition of plated parts on over a thousand prewar cars showed that the corrosion free surfaces varied from 61 pct for bumper guards to 81 pct for copper alloys and hub caps after only one to two winters of service. The general average for plated steel was 65.5 pct, for plated zinc die castings 71.7 pct and for plated copper alloys 81 pct. Therefore, consumers will probably insist on more corrosion-resistant plating on future cars and other consumer goods. Generally, this improvement will involve merely the use of thicker coatings of the conventional copper and nickel. However, in some cases, the trend may be towards alloy electrodeposits, of alloying elements either deposited together or deposited separately and diffused by thermal treatment.



IMPENDING alterations in boiler codes will permit safe maximum operating temperatures for cast irons to rise to the 750° F range. The result will be wider application and greater production for this oldest of metals.

The technique of zinc electroplating has been greatly improved in the last few years. As cadmium becomes more readily available, some shops may return to cadmium where the simplicity of operation outweighs the higher cost of the cadmium. However, many will continue to use zinc coatings, possibly with subsequent surface treatment.

There appears to be a definite trend toward the use of more preplated metal which was just starting before the war. There are many advantages from the standpoint of ease of operation in using preplated sheets or coils as compared with the conventional practice of buying sheet or strip, stamping or punching and then electroplating. Preplated strip may be stamped or formed as the plate is sufficiently good that it will withstand any but the most severe operations without flaking or peeling. This is particularly true in the case of zinc-coated strip where the electrochemical protective action of the zinc will

SEVERE deterioration in plated parts is leading to a demand for more corrosion-resistant plating on future cars. The trend may be to alloy electroplates thermally diffused.

protect the uncovered edge. Sheets and coils are available with zinc, tin, chromium, nickel, copper and brass electroplates. Many small users will welcome the opportunity of eliminating plating operations on their own premises.

Stainless Steel Electroplated

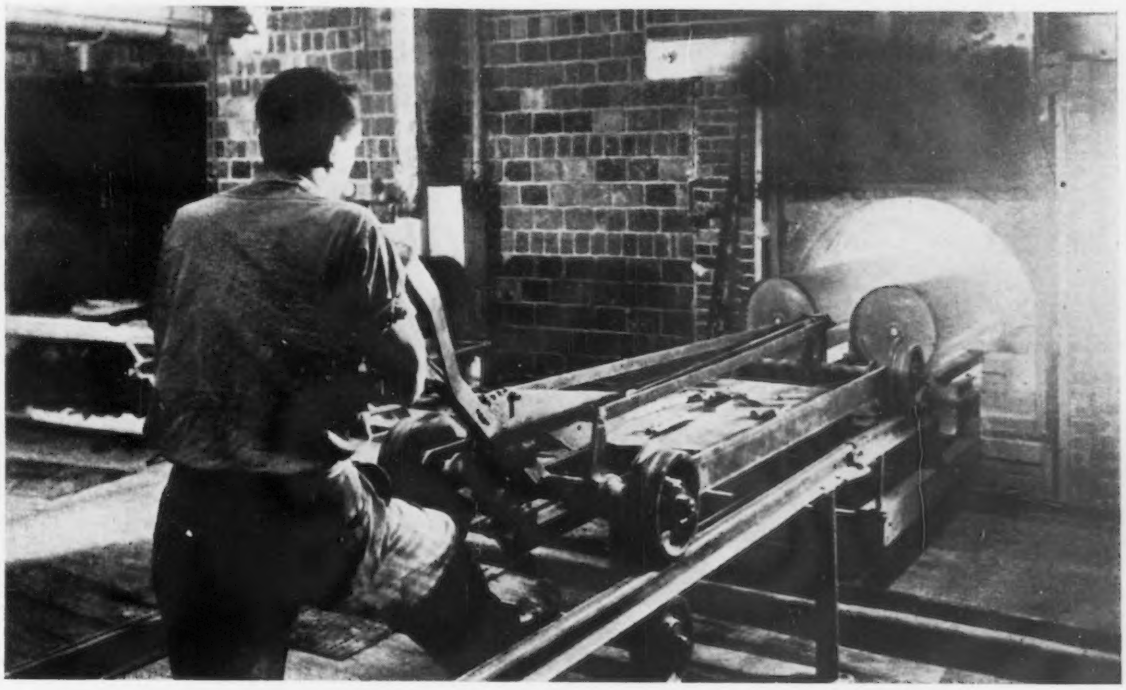
An interesting sidelight on the use of electroplating is the flash-chromium plating of chromium stainless strip on automobiles. While such an idea is shocking to the average metallurgist, it does enable the manufacturer to obtain a perfect color match between the chromium plated fittings and the stainless steel trim while the superior corrosion resistance and forming properties of the stainless steel are still retained.

Electrolytic polishing has again come into prominence for nonferrous and ferrous products. In some cases, the electrolytic polishing is the final operation; in other cases, it merely replaces a series of intermediate grinding and polishing operations. One field where electrolytic polishing can often compete successfully with other finishing means is stainless steel parts. In applications such as refrigerator shelves which are difficult to polish mechanically, electrolytic polishing is bound to be widely used. However, this type of polishing has not yet been perfected for large flat surfaces. Also, in commercial use, the finish before polishing affects the finish after polishing. A rough finish will be brightened but not completely evened out. Several different solutions have been advocated for stainless steel; under proper operating conditions, all seem to give satisfactory results although better finishes are obtained on the chromium-nickel grades than on the chromium types.

Directly opposite from electrolytically-polished stainless steel is blackened stainless steel, first publicly announced during the past year. The thin black coating formed by immersion in a molten dichromate bath is claimed to be adherent, ductile, abrasion resistant and not harmful to corrosion resistance. War time applications included use in parts for rifles and depth sounders. The designer should find opportunity for uses of blackened stainless for nonreflecting parts as well as stunning contrasts between blackened and polished stainless steel.

The improvement in enamels during the war will mean a great extension in the use of enameled steel. Before the war, enamels completely resistant to hot water were not available, but new enamels have been developed which have given considerable satisfaction in hot-water storage tanks. "Glass" lined chemical equipment has obvious disadvantages from the standpoint of impact resistance but has proved the answer to many industrial problems involving highly corrosive chemicals. Another war-time development which may or may not have a peace-time future is the use of enameled tubing as the container for the hot electric wires in domestic electric stove heating elements. A drawback of enameling has been the necessity of using dark colored cobalt enamel ground coats to ensure proper adherence between the top light colored enamel coating and the steel. One method of eliminating the use of a ground coat has been the use of a flash-nickel plate. Another and very promising means is the use of the recently introduced low-carbon-titanium alloy basic openhearth steel. This steel will not blister when enameled without the usual ground coat although a nickel flash is sometimes desirable between pickling and enameling to improve the adherence of the enamel. The thinner enamel thickness reduces chipping and improves the thermal shock resistance of the enamel. The elimination of the ground coat and consequent simplification of the enameling process would seem to justify the extra cost of the alloy steel. This steel has been reported to have excellent deep-drawing properties and to be completely non-aging. Moreover, in an accelerated test for caustic embrittlement of boiler plate, it was found to be completely resistant to cracking. Therefore, it may prove to have a considerably wider field of application than just as an enameling base.

Aluminum and magnesium enter the postwar pic-



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APPLICATIONS for enameled steel show increasing promise through wartime enamel developments. Also, flash-nickel plating and new basis-steel analyses open the way for one-coat enameling.

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ture with a tremendous production as compared with prewar days. Therefore, vast new markets must be opened up. Some of the proposed uses are visionary but both metals will find many new applications. During the war years, many fabricators had to learn how to handle the light metals. Better processing methods and improved alloys were developed. All this not only helped win the war but will also be of great value in gaining new peace time uses. Both metals are expected to find major use in the transportation industry where decreased weight can be proved to have a dollar value and in household, office and light industrial equipment where decreased weight offers a distinct selling point. Aluminum streamlined trains have operated with a great deal of success since 1934. Here there is direct competition with high-tensile stainless steel as well as with the low-alloy high-tensile steels which are receiving increased consideration. The railroads are now interested in aluminum box cars as they are more than ever convinced of the practical advantages of lightweight construction. The A. A. R. has just approved box cars with complete aluminum superstructures made predominantly of R301.

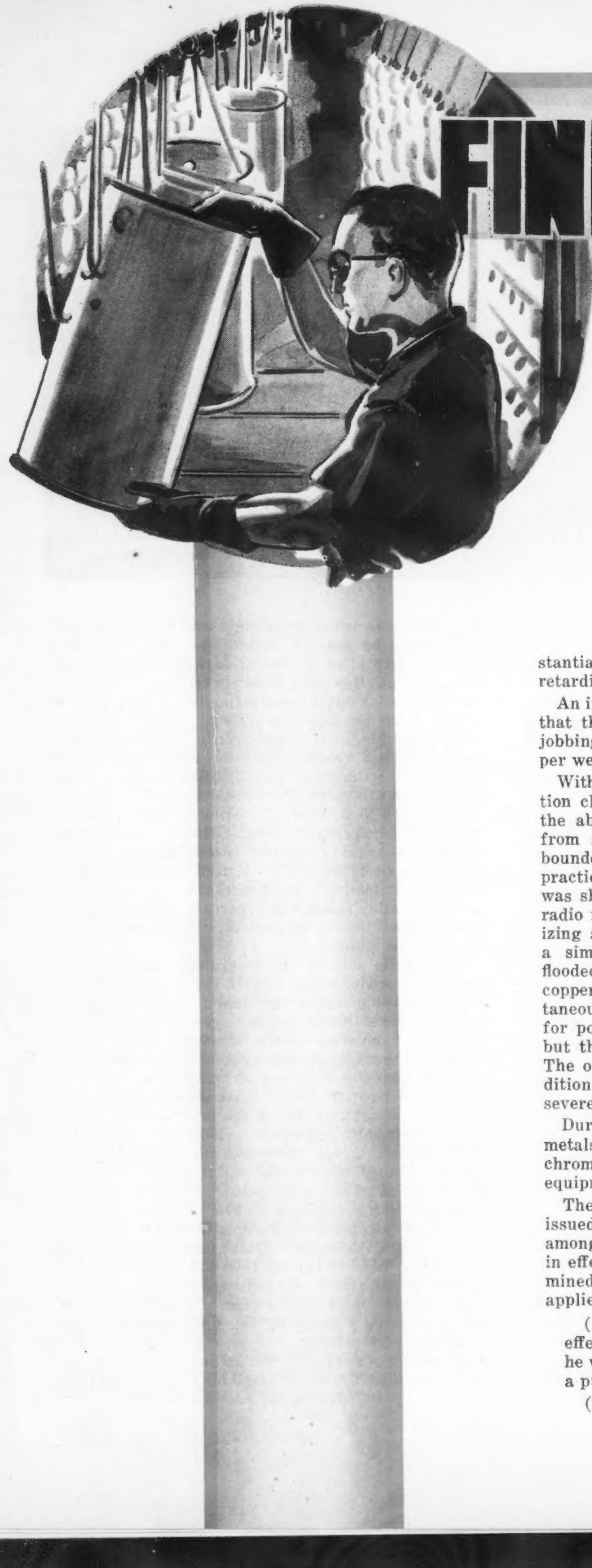
The new high-strength aluminum alloys developed during the war have strength characteristics roughly equal to structural steel in addition to their lower weight and greater corrosion resistance. The composition of Alcoa 75S was just revealed this year as approximately 5.75 pct zinc, 2.50 magnesium and 1.6 pct copper with small amounts of manganese, chromium and titanium. It is obtainable in various forms including Alclad sheet. Reynolds R303 is a similar analysis. This composition contrasts with Reynolds R301, the other type of high-strength alloy, which contains about 4 pct copper, 1 silicon, 0.8 manganese and 0.5 pct magnesium, and is furnished clad with a corrosion-resistant aluminum alloy with about 0.7 pct silicon and 1.2 pct magnesium.

The heat treatment recommendations for Alcoa 75S have been modified somewhat in view of the increasing experience with the grade. Originally, it was recommended that the elevated temperature ageing should be started within the first 2 hr after quenching or after at least 2 days of room-temperature ageing. However, it has been found that other factors in commercial production outweigh the effect of the room temperature ageing. Several commercially feasible interrupted-ageing treatments have been developed which produce the desired mechanical properties and improve the dimpling capacity. The most frequently used interrupted treatment involves ageing for 4 hr at 210° F, cooling to room temperature and then ageing for 8 hr at 315° F. The required ageing time in this procedure is less than the usually recommended 24 hr at 250° F used in single ageing. Progressive ageing treatments may also be used where the alloy is aged at progressively higher temperatures without being cooled to room temperature between the steps.

The results obtained by the interrupted and progressive procedures are nearly the same. The use of the two-step ageing treatment is recommended only for sheets. Other products generally must have the highest possible tensile strength which is obtained by the single ageing treatment. The resistance to stress-corrosion cracking of material aged by the interrupted treatment is at least equal and possibly somewhat superior to that of material given a single ageing treatment. Material which has been cold rolled in the interval between quenching and ageing can be dimpled with fewer failures than material which has not been cold rolled. However, the interrupted ageing finishing at 315° F gives substantially lower strengths in material cold worked after quenching than does the constant temperature ageing of 24 hr at 250° F (about 1000 psi lower for each percent of permanent elongation).

One innovation in the forming of aluminum alloys that may simplify deep-drawing problems is the use of elevated temperatures to give a substantial improvement in drawability. Similar increases in formability are also found in stretching or forming at

(CONTINUED ON PAGE 254)



FINISHING

FROM an economic viewpoint, the electroplating industry has flourished. Contrary to many fears which were felt when the war broke out, electroplating was found to be an important factor in the war effort and as a result its plants were not only used to existing capacity, but substantially increased during the past two or three years. Although polishing almost disappeared from the industry because of the military necessity for keeping reflectivity down to a minimum, the total operating capacity of the industry grew substantially because of the increase in the use of rust retarding and generally protective finishes.

An index of its growth may be noted from the fact that the total manhours of capacity of a group of jobbing shops in New York rose from about 65,000 per week to 100,000 per week.

With the coming of V-J Day, of course, the situation changed overnight. The index of operations of the above-mentioned group of job platers declined from about 75 pct to about 60 pct but later rebounded to about 68 pct. The war finishes like zinc, practically disappeared from the scene. Cadmium was sharply reduced although still important in the radio manufacturing industry. Parkerizing, Bonderizing and other rustproofing processes also suffered a similar decline. The market was immediately flooded with demands for bright-finished work in copper, nickel, chrome, silver, gold and brass. Simultaneously, of course, there was tremendous demand for polishers to turn out this bright-finished work, but this demand was not, and is not yet, satisfied. The outstanding factor of the present overall condition of the electroplating industry is the critically severe shortage of skilled polishers.

During the past year government restrictions on metals were eliminated in almost all instances except chromic acid, chromates and tin. Also, electroplating equipment may now be bought at will.

The OPA Maximum Price Regulation 581 was issued effective March 31, covering job plating shops among other industrial service industries, and is still in effect. Under this regulation, all prices are determined by the first of the following methods which applies:

(1) If the supplier had a published price list in effect on March 31, 1942, he uses the price at which he would have supplied the service on that date to a purchaser of the same class.

(2) If the seller did not have a published price

After making essential contributions to the war effort, electroplating has reverted to civilian work with high luster and colors. The industry is greatly expanded, temporarily short of polishers, but ready to go into new avenues of use, and very confident of a future role relatively even more important than that which it has so successfully filled in the past.

list in effect on March 31, 1942, he uses the highest price or rate at which he sold a service which he supplied more than once between January 1 and March 31, 1942.

(3) For services which cannot be priced by the above two methods, the supplier determines his ceiling by using the same method of computation and the same labor rates, materials prices, machine hour or equipment rates, and the overhead and profit rate for services of the same type which were in effect on March 31, 1942.

(4) For services which cannot otherwise be priced under the regulations, platers may apply to OPA for individual ceilings.

By ADOLPH BREGMAN
Consulting Engineer, New York

UNTIL a few months ago, silver was divided into two classes, foreign and domestic, with foreign selling at about 45¢ per ounce, and domestic at about 71. This differential was eliminated by an increase in the price of foreign silver to 71, the same as domestic, during the latter part of the year.

Early in the war, the need for degaussing or anti-mine protection measures became critical for ships afloat. The long experience of plating generator manufacturers with the low-voltage, high-amperage motor-generator sets required was promptly enlisted by the Navy and in a short time a compact high-speed, two-bearing unit was installed on a substantial number of the Navy's most important fighting ships, battleships, heavy cruisers, light cruisers, aircraft carriers and carrier escort vessels, besides numerous tenders and repair ships.

Other types of work in which electroplating took a primary part in furthering the war effort, are listed below.

Aircraft

Chromic acid anodizing of pontoon floats.

Chromic acid anodizing and special cleaning of airplane cowlings and special ammunition chutes.

Chromic acid anodizing of parts for amphibian planes.

Chromic plating piston rings for aircraft engines.

Ordnance

Cyanide copper, lead and cadmium plating ammunition.

Cadmium plating time fuses; also immersion tin processing.

Cadmium, silver, gold and nickel plating various electrical devices employed in ships and warplanes.

Miscellaneous

Electrolytically tin plated steel strip, saving some 40 pct of the tin as compared with tin applied to steel strip by hot dip.

Zinc plating a wide variety of items, for rust prevention.

Full automatic equipment was perfected for depositing lead and indium on airplane bearings.

High speed nickel plating, to build up worn precision parts for Army Ordnance.

Equipment for "cladding" steel with nickel and copper for ammunition purposes; the clad-steel billets being rolled and subsequently forged into shells. The nickel was deposited at 150 amp per sq ft.

At one time it was the impression that electroplating, although useful, was only an adjunct to the war effort. The fact is, that electroplating was a direct contributor of no mean proportions to the production of war equipment and material.

Research in Electroplating

The American Electroplaters Society has undertaken a substantial research project covering a variety of problems. One of these problems was covered in the paper, "Methods of Polishing Steel and their Effects upon the Value of Electroplated Coatings," by Gerald Lux and William Blym. Additional subjects under investigation at present are as follows:

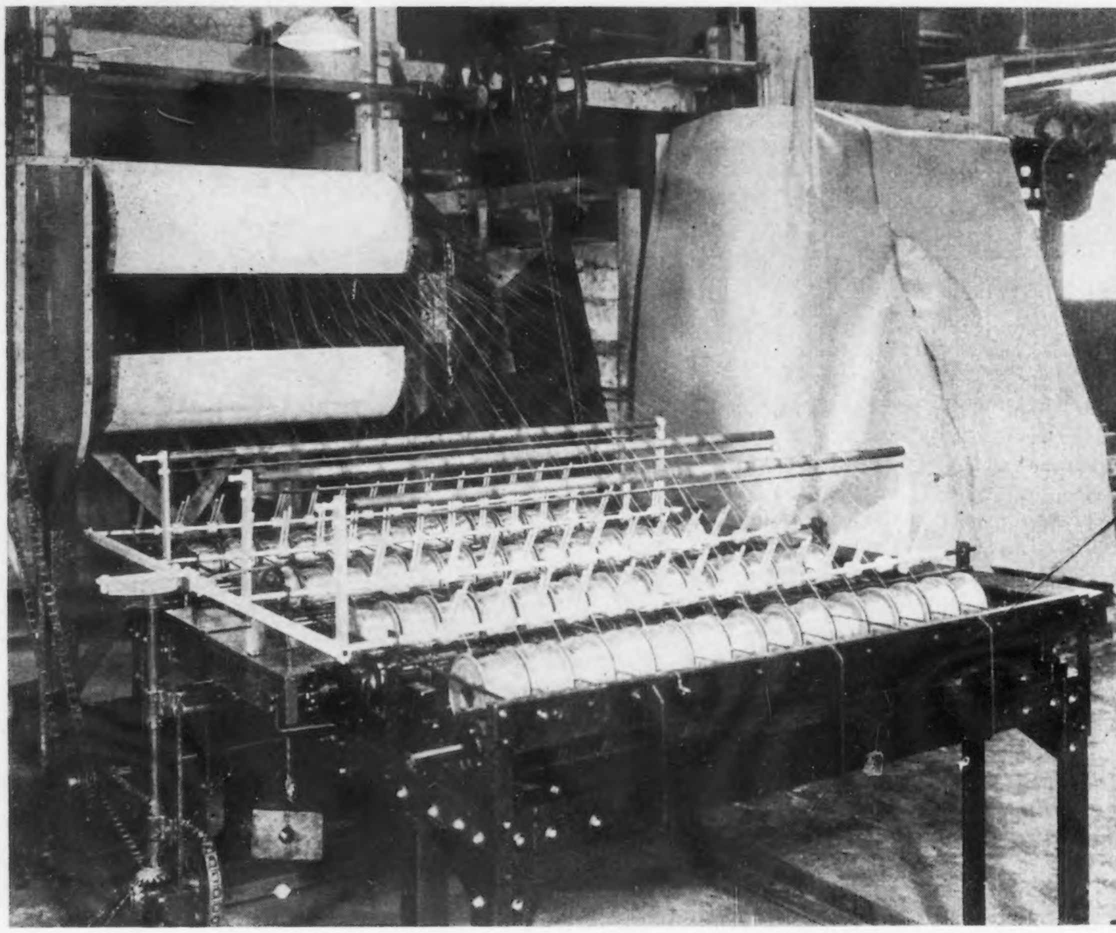
(1) Stripping of copper from various base metals.

(2) Determination of impurities in plating baths.

(3) Study of methods of testing adhesion of electrodeposited coatings.

(4) Investigation of methods of polishing metals other than steel.

The object of the research on polishing was to determine whether the "finish" of steel prior to electroplating affects the protective value of the plated coatings. Strips of cold-rolled steel were polished with wheels to which abrasives of different grain size were glued. The polished specimens were plated with copper, nickel and chromium of controlled thickness and were exposed to the atmosphere at New York, N. Y., Sandy Hook, N. J. and Washington, D. C. Comparison showed that wide differences in the surface finish of the steel had no significant effects on the protective value of the plated coatings. It is possible that use of hot-rolled steel, which is more likely to contain foreign



FINE steel wire, nickel plated in a concentrated Watt's solution, has been developed to replace solid nickel wire for tungsten filament supports in incandescent lamps.

inclusions, would have yielded differences as a result of polishing. Results with accelerated tests, such as the salt spray hot water, ferroxyl, and condensations tests were not as reproducible and consistent as the atmospheric tests.

The ASTM Committee A-5 on Corrosion of Iron and Steel included in its report the results of atmospheric corrosion tests on wire and wire products after exposure for about eight years at 11 test stations. Among the wires are those with zinc, lead, and copper coatings.

Committee B-3 on Corrosion of Nonferrous Metals and Alloys has put out a new Tentative Method of Salt Spray (Fog) Testing, B-117-44T, which removes a great deal of the difficulty encountered in obtaining reproducible results. The Spray Test Subcommittee under C. E. Heussner's chairmanship has formed a small section which is continuing the study of the important factors in salt spray fog testing. Among the members are C. H. Sample, N. E. Promisel, and Gustaf Soderberg.

The subcommittee on Galvanic and Electrolytic Corrosion which has previously conducted some very extensive outdoor tests, has plans for an outdoor corrosion study of the effect on magnesium alloys of contact with other metals, including solid nickel and steel plated with zinc and cadmium.

Committee B-8 on Electrodeposited Metallic Coatings, R. J. McKay, chairman, reported the results obtained during nearly one year of exposure of lead coatings on copper and on steel with and without copper undercoatings in various locations. Various changes are being proposed in the specifications under the Committee's jurisdiction, notably the addition of a new coating class to Tentative Specifications for Electrodeposited Coatings of Nickel and Chromium on Steel (A 166) which will call for a very heavy total thickness of nickel or copper plus nickel.

The Tentative Methods of Test for Local Thickness of Electrodeposited Coatings (A 219) is being revised to permit the use of magnetic methods and dropping tests (including one for lead coatings) when applicable.

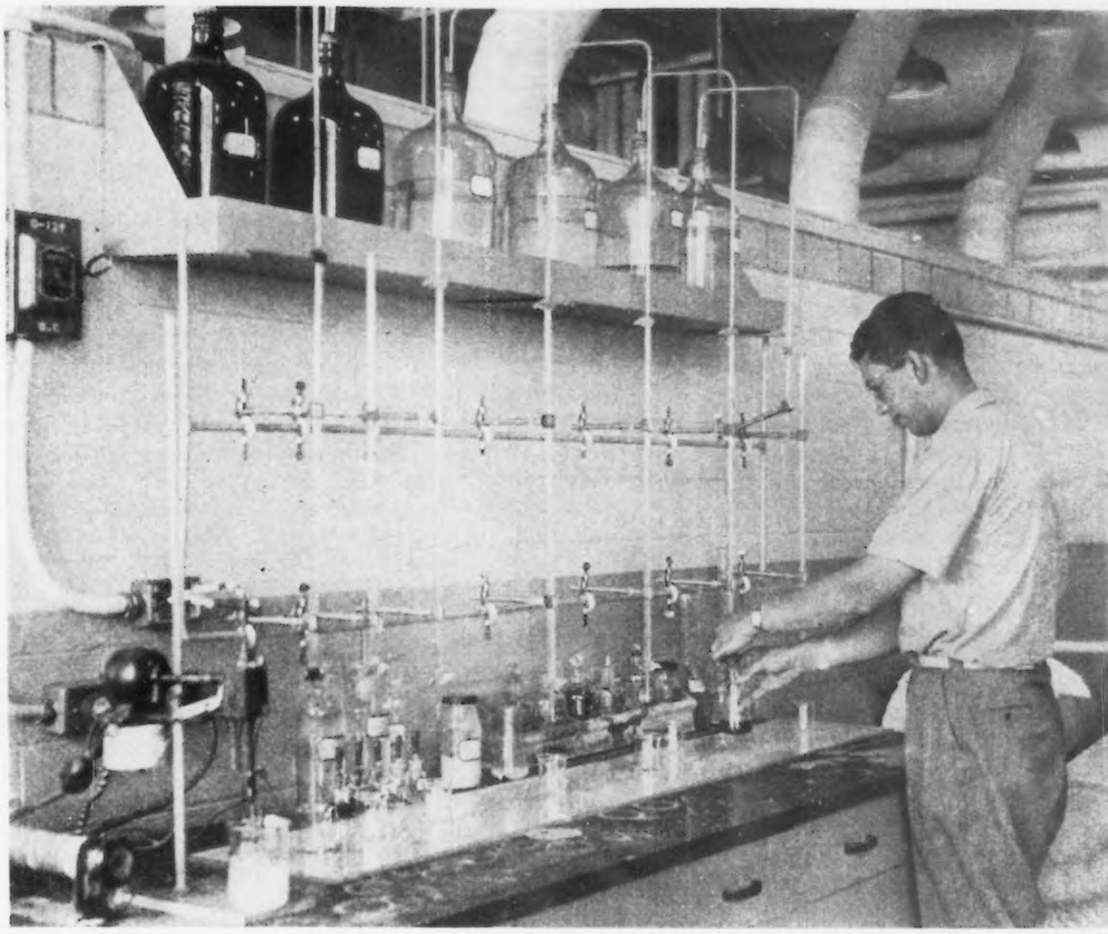
Two new tentative specifications have been completed and will be referred soon to the ASTM for approval, one for chromate finishes on zinc, and one for lead coatings on steel.

Among the actions taken on the recommendation by Committee D-12 on Soaps and Other Detergents is the adoption as standard of the heretofore Tentative Methods for Chemical Analysis of Industrial Metal Cleaning Compositions (D-800).

Committee D-19 on Water for Industrial Uses reported that the work on the ASTM Manual on Industrial Waters is progressing.

A paper on "Performance Tests for Metal Cleaners", by Harris, Mears, Stericker, Vaughn and Burkard discussed the problems involved in the consideration of methods and specifications for metal cleaning. The question is complicated because of the variety of metals and metal finishes, as well as the infinite variety of soiling agents which may be encountered. This paper was prepared in order to provide information regarding suggested or currently used evaluation tests in readily available form.

The fundamental aspects of cleaning were considered in the paper "What is a Clean Surface," by Ernest H. Lyons, Jr. A classification of films on metals was presented. Plating on a truly "clean" surface, consisting of bare, virgin, basis metal, is a very remote



PLATING solution control laboratory in the R. & H. Chemicals Department of du Pont, Niagara Falls. Here routine and special analyses are run on electroplating solutions, and research conducted on simplification of control methods.

possibility. However, the presence of films of the proper sort is not objectionable and may even improve the deposit. Therefore, a "clean" surface is one on which any objectionable films have been replaced by others more suitable for electroplating, a replacement accomplished either in a series of cleaning baths, or in the electroplating bath itself, or most likely, in both.

Miscellaneous Electroplating Developments

Supersonics are by way of becoming useful in metal finishing, according to Jules Pinsky of the Crystal Research Laboratories, Stratford, Conn. Making use of that property of supersonic vibrations which blasts off an outer layer of metal, Thiemann has been successful in applying a tin coating directly to aluminum with no intervening oxide film. In his work, Thiemann applied the supersonic vibrations to the aluminum sheet as it was dipped in the molten tin bath. The rapid back and forth vibrations of the particles of tin in the molten bath, with the great momentum that the high frequency oscillation produces, causes the oxide layer on the aluminum to be literally knocked off and to be replaced immediately by a layer of tin which is actually alloyed with the aluminum surface. This same effect, it is believed, will work for the other light metals in the aluminum series.

Electroplating with superimposed alternating current continues to receive close attention by reason of advantages such as improved throwing power and reduction of anode polarization.

Ordinary water can now be transformed into the chemical equivalent of distilled water by simple filtration, through synthetic resin, resulting in anion exchange. This process has been extended to metal recovery, according to Sussman, Nachod and Wood, of the Permutit Company, New York. Chromium, vanadium, molybdenum, gold, platinum, palladium, and other metals may be removed from waste solutions by absorption on anion exchange resins under given conditions.

The resins to be used for the anion exchange are first exhausted with an acid, usually hydrochloric. The solution bearing the metal as a salt is then introduced, and is permitted to flow over the resin at a rate sufficiently slow to permit effective contact. The metal is held by the resin, and the chloride ion is released.

The anion exchange resins undergo no permanent change and may be re-used indefinitely.

Metal salts are absorbed even from very dilute solutions, and bound as metallic resinates. When complete absorption is no longer obtained, the resin is regenerated with an alkali, usually a sodium compound, and the metal is recovered as the sodium salt of the formerly bound metal. By proper adjustment of the process, the final solutions may be 25 or 30 times as concentrated as the original liquor.

With chromium plating solutions, it was found possible to recover a solution containing as much as 3 pct of sodium chromate, which can be used to replace water in making up new plating solutions.

New Anion Exchange Recovery

In contrast to many previously proposed processes for the recovery of metals of this group, the new anion exchange process provided the recovered metal in the form of a salt that may be used directly in plating or other processes. Because of the high prices they command, the precious metals, such as gold, platinum and palladium, may be recovered economically by the simpler alternate process of burning the anion ex-

change resin after saturation with the metal. Because the anion exchange resins are themselves almost entirely free from ash-forming impurities, the residue from this process consists of the practically pure metal.

Plating upon aluminum by preparation of the aluminum by zinc immersion is attracting wider attention. After the aluminum is suitably cleaned it is immersed in a solution of sodium hydroxide and zinc oxide which forms sodium zincate. This solution deposits a thin layer of zinc on the aluminum, by replacement. The work can then be plated in a Rochelle copper solution and then covered with any other metal.

A new coating thickness gage was described by S. Lipson, which employs the electromagnetic principle for determining the thickness of non-magnetic coatings on steel. As a soft iron core is withdrawn from the field of an energized alternating current solenoid, the magnetic pull upon the core increases. If the solenoid is held in a vertical position over a coated steel article and lowered sufficiently to permit the lower end of the core to contact the surface, the distance through which it must be raised for the pull of the solenoid to overcome the attraction of the core for the ferromagnetic basis metal will vary inversely with the thickness of the coating.

The reproducibility of the instrument was found to range from + or — 5 pct for films 0.002 in. thick to + or — 3 pct for coatings exceeding 0.002 in. Voltage variations occurring within reasonable limits had no significant effect on the accuracy of the determinations. The experimental instrument, used to measure coating thickness up to 0.008 in. is simple, small in size, low in cost, and rapid in operation.

Electrography is applicable to the examination of electrodeposits, according to H. D. Hughes. The electrographic method of examining metallic surfaces has undoubtedly been derived from the contact print methods of determining the location of sulphides in steel and of checking the porosity of electrodeposited coats on steel. The advantage of applying an electric current to insure the solution of the particular spots required is obvious, and the electrographic method of printing makes use of this. The method has obvious advantages as a non-destroying test of electrodeposited coatings, and most metals that can be plated out by electricity have been examined by electrographic methods.

Electrolytic polishing of stainless steel and other metals continues to command wide attention and steadily growing interest. A strong need exists for a satisfactory, economical method of so treating cold-rolled steel.

The preparation of copper powder by electrodeposition was described by A. W. Hothersall and G. E. Gardam, covering a laboratory investigation carried out for the British Non-Ferrous Metals Research Association, to determine the most suitable and simplest conditions for the production of copper powder.

Coherent deposits of copper are produced by the electrolysis of copper sulphate solutions provided that an adequate supply of copper ions is maintained at the cathode surface. If the supply is inadequate, the potential rises, hydrogen commences to be discharged with the copper, and the deposit becomes powdery. These conditions are obtained by using a solution of relatively low copper and high acid concentration with a high current density and a relatively low temperature.

As a result of laboratory experiments, the following conditions are recommended:

Solution
$CuSO_4.5H_2O$ .... 50 g per liter
H_2SO_4 .... 150 g per liter
Cathode Current density 72 amp per sq ft.
Temperature 86° F.
Anode area not less than cathode area.
Inter-electrode distance as small as possible (governed by method of removing the powder).

The most compact plant would result from the use of flat anodes and cathodes, although some reduction in tank voltage might be obtained by using anodes with a ribbed or wavy surface. This would tend to disappear as the anodes became corroded.

The powder must be removed periodically from the cathodes, otherwise the increased surface area may result in the formation of a coherent deposit. The method used in the laboratory tests so far carried out was to brush the cathode every 15 min with a stiff bristle brush.

Protective Value of Electrotin

The protective value of electrotin as an undercoating, was investigated by S. Wernick in connection with the protection of certain ferrous components which were required to withstand severe marine conditions on Admiralty equipment.

An analysis of the metal distribution showed that an undercoating of tin influences the distribution of the subsequent deposit favorably, and it is suggested that the effect on the distribution of the subsequent deposit is one of the prime factors in increasing corrosion resistance. It is believed that the use of a tin undercoating for such plates as zinc, cadmium, and to a lesser extent, nickel, is likely to be of some importance in the finishing of ferrous components, particularly those of complex shape, which are required to withstand difficult corroding conditions of service.

J. M. Sprague conducted an investigation to obtain silver plate, up to 0.002 in. thick on steel, the coating to withstand a temperature of 750° F. for at least 1 hr without blistering or apparent decrease in adhesion. Direct deposition of silver on this steel, or silver plating on an undercoat of cadmium or of nickel, did not prove successful. The procedure found the most satisfactory consisted essentially of anodic etching (in sulphuric acid) and the subsequent provision of undercoats of nickel followed by copper before striking in silver and silverplating.

C. W. Richards found evidence to indicate that chlornapthalene wax can be usefully employed as a stopping-off medium, and that its chief advantages are:

(1) Complete resistance to all solutions used in electrodeposition process.

(2) Easy application and ready removal for re-use.

(3) Rapid solidification of coating with consequent increase in speed of production.

There are however, limitations to the use of chlornaphthalene, such as the toxicity of the material.

G. E. Gardam described the production of machinable chromium deposits. The occasion was the need of applying a chromium deposit in such a position that grinding was impossible, and machining had to be resorted to.

A deposit prepared at 200 amp per sq ft at 85° F. had a diamond-pyramid hardness of about 400 and was less brittle than the lustrous deposit. It could

readily be machined with the usual type of carbon or high-speed steel cutting tool whereas the lustrous chromium can only be ground.

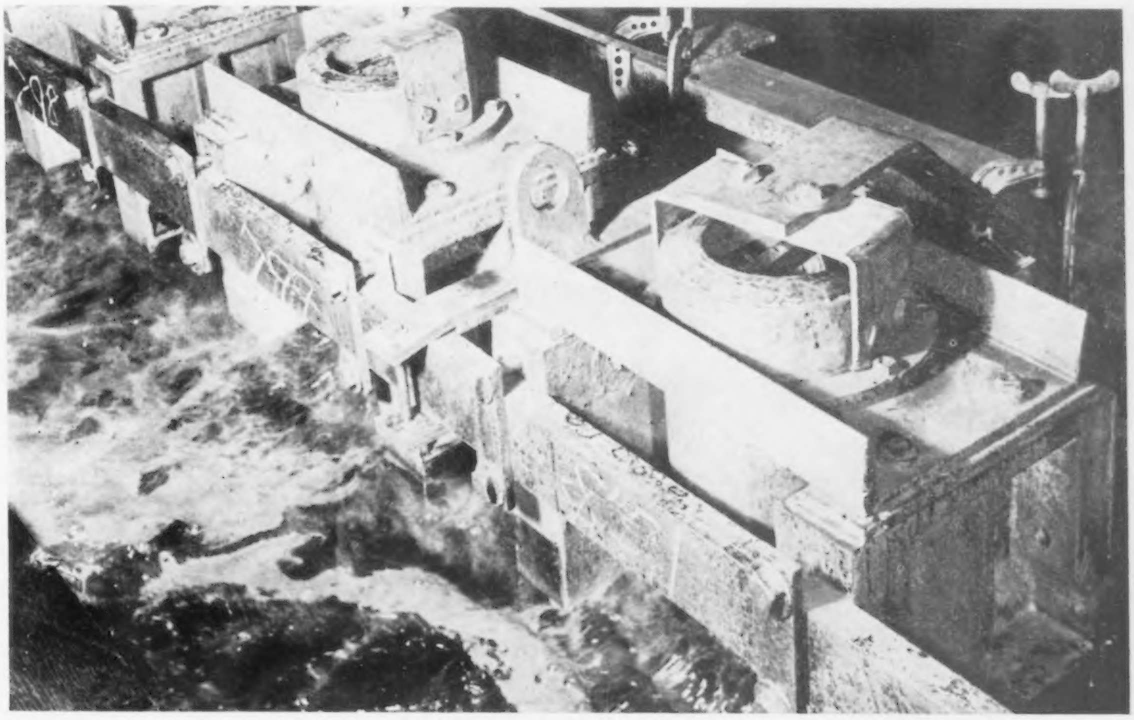
An example of a suitable composition is:

Chromic acid (CrO_3)	250 g per liter
Sulphuric acid	2.5 g per liter
Iron (added as ferrous carbonate)	25 g per liter

Aluminum (15 to 25 g per liter) is also efficacious, and is best added as the hydroxide.

The hardness of the deposit can be further reduced and its machinability improved by low temperature treatment at a temperature which does not detrimentally influence the properties of the underlying metal, for example, within the range of 300° to 480° F for several hours.

Experiments showed a marked increase in tensile, impact and flexural strength for many synthetic resins plated as compared with the values for the same resins not plated. An appreciable increase in resistance to distortion from heat and a decrease in percentage of water absorption are obtained by complete envelopment of the plastic article in a metallic coating. The most important advantage of plating on plastics is the greater corrosion resistance of a metallic deposit when it is applied to a plastic basis than when applied to the usual metallic basis, since there are no galvanic couples with a non-metal base.



CHROMIUM plating diesel cylinder liners. By use of anion exchange resins, it is possible to recover a solution containing as much as 3 pct of sodium chromate, which can be used to replace water in making up new plating solutions.

A paper on anodic coatings with cystalline structure on aluminum by Cyril S. Taylor, C. M. Tucker and Junius D. Edwards described a variety of experiments which indicate that an x-ray diffraction pattern corresponding to that of gamma alumina is obtained when the formation potential is above about 100 v. The formation of a crystalline coating does not seem to be a characteristic of this electrolyte only, for crystalline coatings were obtained with a variety of electrolytes. In some way, high electric stress seems to favor the formation of an ordered oxide lattice.

Dyed Finishes on Oxide Coatings

An important development in connection with the anodizing of aluminum was the production of dyed finishes on oxide coatings formed in the chromic acid bath. Complete details were offered by Darrin and Tubbs, including anodizing conditions, dyes and dyeing procedures.

A discussion of the electrodeposition of metals on plastics by Harold Narcus pointed out the advantages of depositing metals on organic plastics on the basis of comparisons between unplated and plated plastics.

To render the plastic surface conductive, using fine metal powders in a lacquer or varnish medium, or metal spraying, or cathode sputtering, or metal evaporation, have proved successful. The chemical reduction method described in detail is best adapted to an economical production set-up. This method involves the application to the plastic surface (after proper preparatory treatment) of a conductive and adherent bond coat by using a solution of ammoniacal silver nitrate or other easily reducible metallic salt and a suitable reducing agent (usually organic), followed by an intermediate layer of electrodeposited copper or silver, and finally by a top layer of the desired metal such as chromium, zinc, iron, lead, nickel, gold, silver or cadmium.

The preparatory treatments of the plastic surface are the governing factors which make for success or failure of a process for plating on plastics.

A high pH indium cyanide bath was described by J. B. Mohler, Cleveland Graphite Bronze Co. Since the electrochemical properties of indium are similar to those of cadmium, it was thought that the addition of caustic to the cyanide bath might improve the properties. With this thought in mind, a laboratory scale investigation was undertaken. The following com-

(CONTINUED ON PAGE 284)

WELDING

By H. E. LINSLEY
Machine Tool Editor

THE stone that the builders rejected has indeed become the head of the corner. It is well within living memory that welding, apart from the ages-old blacksmith's hammer weld, was regarded as a makeshift process to be used in repair work if nothing else would serve; today, welding occupies a proud place as a major metalworking process. Winnie the welder is fully as well known as Rosie the riveter, and fully as important in the manufacturing field.

The tremendous pressure of war demands, especially in the shipbuilding and aircraft industries, has been responsible for many of the extraordinary advances made in the art of welding, and in this respect some good has come out of war. Many of these developments would have eventually come into being in the normal course of events, though it might have taken many years. Others would perhaps never have been discovered, since they were brought about by dire necessity or by someone foolishly trying, but succeeding, in doing the impossible.

Shipbuilding, during the early part of the year, continued to hold the center of the stage, and while activities along this line have come to a virtual standstill since V-J day, it seems highly probable that welded construction will be pretty much standard for regular shipbuilding when this is again resumed. Conventional practice has been to use square, butt-welded seams for the greater part of the hull construction, and this has brought to light the necessity for perfectly matched plate edges. Plates must be cut so that each joint and seam fits tightly to each other to permit the use of machine welding in the prefabrication process, and to prevent the weld metal from flowing through. Flame cutting by hand to templates was slow, and produced irregularities which resulted in variable width joints. To offset this, the fabrication of cam-cut plates has been introduced with excellent results. Through the use of a flame planer, plates may be cut to shape by burning along opposite edges simultaneously, thus counteracting the distortion due to uneven cooling which occurs when each edge is burned to contour individually. This new technique has reduced cutting time to less than one half of that formerly required, has overcome, to a large extent, the limitations caused by the human factor in bringing new ease and speed to production, and has made pos-

Secure in its position as a practical machine shop tool, welding promises to retain its war-won role as a preferential fabrication technique for small and medium-size vessels, and there is also growing acceptance of weldments to replace castings for the larger elements of machines and tools.

sible much more reliable welds. Plate edges can now be trimmed to any desired contour and combination of bevels within limits of 0.003 in.

Despite the care taken in plate preparation, however, serious distortion is apt to occur during the actual welding process, particularly when the plates are thin. Studies made during this past year have indicated that one constructive approach to the problem lies in the application of magnetic chucks for plate holding, during automatic welding. Using the principle of consequent poles, and by proper spacing of the magnets with respect to the weld seam, it has been possible to avoid any interference by the magnetic flux with the desired characteristics of the arc. Chucks are made up in self-contained units, energized by power from the welding generator, and so designed that a small reverse current can be passed through them to instantly disengage the work. For light work, a solid copper backup bar is provided, but for heavier work a copper coated square steel tube is used, and water is circulated through this to reduce the temperature and increase welding quality and efficiency. Pioneered by California Shipbuilding Corp., these chucks have greatly simplified welding practice by eliminating the necessity for tackwelding to platens, or dogging down edges and strong-backing to hold the plates fair. Furthermore, the local restraint furnished by the chucks minimizes the stresses set up by heat and mechanical action during welding, and thereby combats distortion. Used in conjunction with submerged melt welding machines, these magnetic chucks have reduced costs almost one third below those of manual welding.

THIS type of hold down is, of course, suitable for flat work of a repetitive nature, but for smaller work and irregularly shaped parts would be too costly and impractical. An interesting technique, however, has been worked out by Westinghouse. Developed originally for welding stainless steel rails to the edges of a U shaped stainless steel ammunition chute, the process, known as reverse skip welding, consists of welding about 5 in. in one locality and then skipping across to a correspondingly opposite area and depositing a like bead. By always laying a new bead in the opposite direction of the old one in joining beads, it is possible to spread out the total heat more evenly and dissipate much of the effect of abnormal stresses occasioned by the welding process.

Another anti-distortion system is the technique worked out by California Shipbuilding Corp., and known as the Twin-Arc system. With two welders working on opposite sides of a seam, one slightly ahead of the other, welding efficiency is improved, cracking of the root pass is avoided, back chipping eliminated, and warping and residual stresses materially reduced.

Indicative of the growing interest in welded construction is a recent announcement by American Locomotive Co., of the manufacture of 100 locomotive boilers in which all barrel courses were welded longitudinally with inside and outside welt straps. Elimination of riveted joints does away with the chances of seepage between plates, which is likely to occur even when the best possible riveting technique is employed, and furthermore, the elimination of boiler leaks removes the possibility of cracked sheets which are frequently a major item of maintenance cost when high pressures and high operating speeds are involved. Internal cleaning is simplified by the smooth interior surfaces, and, depending on the size and type of locomotive, weight savings may amount to anywhere from 3000 to 6000 lb. The fact that ASME has already set up detailed rules for the fabrication of such boilers would appear to point to greatly increased use of this type of construction in the next few years.

Still another application of welding to locomotive work is found in the recent construction by the Pennsylvania Railroad of integral locomotive cylinders and saddles. Flame cut from plate ranging in thickness from 1 to 2 in., and comprising 77 different parts, the entire assembly weighs about 26 tons, and while this is no mean figure, it represents a very substantial saving in weight over the conventional cast structure.

ONE of the most significant developments during the past year has been the introduction by Lincoln Electric Co. of a new type of automatic, hidden-arc welding known as Lincolnweld. Possessing unusual flexibility of application, the new process differs from others in that a single grade and type of flux, together with one analysis of electrode, can be used with the same procedure for a wide range of steel analysis. Thus, special joint preparation, changing of flux, wire analysis, and welding procedure are eliminated, which is important to users of automatic welding.

While the equipment may be mounted on wheels running over the surface of the work, as in welding deck plates, its widest utility would appear to be in applications where it is mounted on an overhead beam and either traversed automatically over the work or held stationary while the work is passed underneath. The automatic welder is thus passing out of its normal field, and may be classed almost as a machine tool. Indeed, some interesting equipment is now being made for installation in production lines, and incorporating

one or more welding heads. Semi-finished work is passed from the preceding machine, located in special holding fixtures, automatically welded as required, and then passed on for final machining or assembly. The operation is performed so rapidly that heat penetration, even on light stock, does not interfere with handling or cause misalinement of previously machined surfaces.

Automatic Aluminum Welding

The automatic arc welder has also been used very successfully in the welding of aluminum by the use of a carbon arc and aluminum filler rod. The peculiar advantage of this method, apart from the welding speed, is that no plate edge preparation is necessary, the edges being left square. In consequence, considerably less filler rod is required, and the beveling time is saved. Quarter-inch aluminum plates have been welded by this method at speeds of 16½ in. per min. and while it was used on a vast scale during the war for the manufacture of special military bridges, it would appear that the anticipated huge increase in the use of aluminum for civilian goods would make it of particular value in the postwar era.

The present serious shortage of castings is causing considerable concern to machine tool builders, and from all indications the situation will not improve for some time to come. Despite all efforts to improve working conditions by ventilation and mechanization, foundry work still remains for the most part, hot, heavy, and dirty. It may be argued that not all foundry workers are in contact with the hot part, but the fact remains that unless workers can be found who are willing to endure this part, the foundry must close down. The same holds true for the dangerous parts, as well as for the heavy and dirty ones, and there is no disguising the fact that foundry jobs are going a-begging while hundreds, perhaps thousands of former foundry workers look for more congenial work.

Under these circumstances, machine tool builders, among many others, are turning a favorable eye to welded construction for such traditionally cast parts as machine bases. For special machines, of which only one or two may be built, the advantages are obvious; expensive patterns are eliminated, and last minute changes can be incorporated without much difficulty. It is not only in the special machine field, however, that interest is being aroused, and several manufacturers, including some who operate their own foundries, are turning to welding to speed delivery of standard machines. Machining costs are generally lower, overall weight is reduced, scrap losses due to faulty castings are eliminated, and adequate rigidity is obtainable by proper gusseting. Moreover, the smooth surface of plate makes finishing a simple matter, and does away with the necessity for the lengthy and costly filling operations required to produce a smooth, easily cleaned surface on a casting. In plants which do not have their own foundries, the use of weldments cuts down their dependence upon outside sources of supply.

Even in press manufacture, where steel castings have always been considered essential, weldments have been taking a firm hold, and hydraulic presses of as high as 2500 ton capacity are now being made of welded construction, as also are punching, forming, straightening, die-casting, stretching, and injection molding presses. In some of these the plates may be as thick as 8½ in., and the welded frame may weigh many thousands of pounds. The use of welding on moving parts permits these to be of lighter weight, and cuts down on operating costs.

In connection with press work, it is interesting to note that dies for some time have been fabricated by applying a tool steel cutting edge to a carbon steel body. The die blank is flame cut from a suitable piece of plate, and rough machined to within 1/32 in. of size. A "J" groove is then formed in the working edge, and several beads of tool steel welding rod are run in to build up the edge to the required size: The entire die is then ground to size. Tests indicate that dies manufactured in this way cost from 60 pct to 30 pct of the cost of solid tool steel dies and will produce up to 100 pct more pieces between grinds.

Resistance welding, a well established process before the war, has made rapid strides in development, and there are many gas and arc-welding operations which could perhaps be performed equally as well, and at lower cost, by this process. New techniques have been developed for resistance welding of aluminum and magnesium alloys, as well as for heavy steel sections, and there are indications that the steel companies will yield to popular demand by supplying a wide variety of rolled shapes and sections formed from cold-rolled strip that will lend themselves particularly to welding.

• • Compiled from information supplied by the manufacturers, the accompanying charts list the most commonly used arc welding electrodes under their AWS and AISI numbers, together with their corresponding brand names.

Until recently the spot welding of heavy-gage aluminum alloys has not been considered practical because of the tremendous low power factor demand required by the ac machines previously used. As pointed out by C. W. Dodge in a recent article in the Welding Journal, however, the power supply problem has now been relegated to a secondary place by the advent of the stored-energy type of machines. From tests conducted on 24ST Alclad, as well as on other types of alloys, it has been concluded that there are certain basic laws governing the welding of all thicknesses which hold true for all alloys and machines.

The laws controlling the factors entering into the welding of heavy sheets of aluminum alloy became apparent after three basic assumptions were made.

(1) In order to obtain the type of weld desired it is necessary that the slug be four times the sheet thickness in diameter.

(2) It is possible to weld any thickness of aluminum alloys and obtain exactly the type of weld desired with exactly the same technique as for any other thickness, provided certain basic laws are followed.

(3) Welds made on 0.040-in. material with a **machine whose range is 0.016 to 0.081 in. are made under the best possible conditions, and that the magnitudes of all factors producing an optimum weld on this thickness may be used as the basis for all values determined for other thicknesses according to the laws developed.**

These assumptions were made purely from a thorough study of empirical data gathered from experience in welding aluminum alloys over a long period of time. The first of the above forms the actual basis of all developments and was determined from observing that in all cases where the slug diameter of a completely

(CONTINUED ON PAGE 141)

Table I Compara

A W S Class No.	Description	Air Reduction	Allied-Weld Craft	American Agile	Anthony Carlin	Champion Rivet	General Electric	Harnischfeger Corp.	
E-4510	Wire with coating applied before drawing	41-63	Arc-Craft B			Sulcoat Processed	L	Dustcote Washcote	
E-4511	Wire with light coating applied after drawing				P-180		F		Su
E-4520	Wire with coating applied before drawing		Arc-Craft B			Speed Rod	W-3 B		
E-4521	Wire with light coating applied after drawing						W-4		
E-6010	Heavy coating, d c Electrode positive	78E & 79E	Arc-Craft 55 & 55W		P-50-x P-50-x V & O	Blue Devil	W-22	AP	No
E-6011	Heavy coating, a c	230	77 & 77W	Blue		Bluedac	W-26	AC-1	AC
E-6012	Heavy coating, d c or a c, electrode neg.	87 & 187	70 & 70W	Red-White	P60 & P61	Gray Devil & Gray Devil No. 2	W-20 & W-30	FR, PF	No
E-6013	Heavy coating, a c usually	90 & 90A	77W	Blue-Red	P-100	Graydac	W-25	AC-3, SM	AC
E-6020	Electrode neg. for fillets; pos. for flats; a c also	81 & 315	60	Blue-Gray	P-70	Black Devil	W-24 W-27	DH-2	No
E-6030	Electrode pos. on d c Also a c			Blue-Gray	P-80	Red Devil	W-23		No
E-7010	d c electrode pos.	93 carbon moly	Arc-Craft Moly	Black-White	Moly-C-Alloy No. 1	Blue Devil 85	W-52		Ne
E-7011	ac only	382 carbon moly		Black-White				CM50-1	
E-7012	Electrode neg. d c Also a c								N
E-7020	Electrode neg. for fillets, pos. for flats; also a c	94 carbon moly	Arc-Craft 70		Moly-C-Alloy No. 2	Black Devil 75	W-54	CM50-2	N
E-7030	Electrode pos. d c or with a c					Red Devil 75			
E-8010	d c, electrode pos.		Arc-Craft Moly					P & H 80	

Table I Com

Allied-Weld Craft	American Agile	Anthony Carlin	Champion Rivet	General Electric
Arc-Craft B			Sulcoat Processed	L
		P-180		F
Arc-Craft B			Speed Rod	W-3 B
				W-4
Arc-Craft 55 & 55W		P-50-x P-50-x V & O	Blue Devil	W-22
77 & 77W	Blue		Bluedac	W-26
70 & 70W	Red-White	P60 & P61	Gray Devil & Gray Devil No. 2	W-20 & W-30
77W	Blue-Red	P-100	Graydac	W-25
60	Blue-Gray	P-70	Black Devil	W-24 W-27
	Blue-Gray	P-80	Red Devil	W-23
Arc-Craft Moly	Black-White	Moly-C-Alloy No. 1	Blue Devil 85	W-52
	Black-White			
Arc-Craft 70		Moly-C-Alloy No. 2	Black Devil 75	W-54
			Red Devil 75	
Arc-Craft Moly				

omparable Arc Welding El

eral tric	Harnischfeger Corp.	Hobart	Hollup	Lincoln	Marquette	M
	Dustcote Washcote		Type No. 30S			21
		Sulkote	Type No. 30S	Stable-Arc Kathode	Dustcoat—D. C. No. 101—A. C. or D. C.	2
			Type 30XL	Swiftweld		3
			Type 30S			
	AP	No. 55	Sureweld B	Fleetweld 5	Type 31-DR	15
	AC-1	AC-55	Sureweld CB	Fleetweld 35	Type 130	11
& W-30	FR, PF	No. 77	Sureweld N	Fleetweld 7	Type 25-ADS	17
	AC-3, SM	AC-77	Sureweld CN	Fleetweld 37 Fleetweld 47 Planeweld 2	Type 151	14
	DH-2	No. 111	Sureweld F	Fleetweld 11	33-ADS	16
		No. 111	Sureweld A	Fleetweld 9		18
		No. 885	Sureweld MLY-50	Shield Arc 85		71
	CM50-1		Sureweld MLY-C			71
		No. 77			Type 75	
	CM50-2	No. 111-HT	Sureweld MLY-A			71
			Sureweld MLY-A	Fleetweld 11-HT		
	P & H 80		Sureweld HSV			

e Arc Welding Electrodes for Steel

Hollup	Lincoln	Marquette	McKay	Metal & Thermit	Page	Reid-Avery	A. O. Smith	Standard Steel	Un	Univers
Type No. 30S			21		Page B-Special	Raco Blue Label		Std. B Prescote		Staidar
Type No. 30S	Stable-Arc Kathode	Dustcoat—D. C. No. 101—A. C. or D. C.	2					Std. Dipcote	Una 160	Staidar
Type 30XL	Swiftweld		3			Raco Type D Raco Type M		Std. B. Stablecote		
Type 30S									Una 160 Una 156	
Sureweld B	Fleetweld 5	Type 31-DR	15	Vertex	Hi-Ten C	Raco 7	SW-10	Greyhound Type R		Hevi K
Sureweld CB	Fleetweld 35	Type 130	11	Type A		Raco 11	SW-14	Greyhound Type AC		Easy w
Sureweld N	Fleetweld 7	Type 25-ADS	17 & 116	Genex	Hi-Ten F & G	Raco 8	SW-11	Greyhound Type S	UC-49 (Automatic)	Hevi K
Sureweld CN	Fleetweld 37 Fleetweld 47 Planeweld 2	Type 151	14	Alternex Type U	Hi-Ten AF & G	Raco 13	SW-15 & SW-16	Greyhound Type AC	UC-49 (Auto.)	Easy w
Sureweld F	Fleetweld 11	33-ADS	16	Type F Type FHP Fillex		Raco 20	SW-35			Hevi K
Sureweld A	Fleetweld 9		18	Cresta		Raco 5	SW-20		UB 159 (Auto.)	Easy w
Sureweld MLY-50	Shield Arc 85		715	Molex		Raco 74	SW-75			Hevi K
Sureweld MLY-C			711	Type MA		Raco 7011				
		Type 75								
Sureweld MLY-A			716	Type N—Type M Carbon Moly .50 Type O		Raco 64	SW-73 SW-76			
Sureweld MLY-A	Fleetweld 11-HT						SW-73			
Sureweld HSV										

Universal Power	Westinghouse	Wilson Welder
Staidarc B	Flexarc Grade 18	17 & 18
Staidarc G		
Hevi Koat RP	Flexarc AP	98N & 98N, V & O
Easy weld C2		530
Hevi Koat SP2	Flexarc FP & SW	107 & 108
Easy weld C2	Flexarc FP & SW	520 & 520A
Hevi Koat FF	Flexarc DH	105 & 106
Easy weld C2	Flexarc DH	
Hevi Koat HT		Alloyrod A—carbon moly
		582—carbon moly
	Flexarc FP & SW	
		Alloyrod B—carbon moly

Table II Compar

AISI No.	Air Reduction	Allied Weld-Craft	Alloy Rods	Arcos	Champion Rivet Co.	Crucible Stee
301X				Chromend 16/7		
302		Stain-Craft K				Rezistal No. 2-
302B		Stain-Craft KS				
303		Stain-Craft K				
304						
306						
308	19-9		Arcaloy Type 308	Stainlend K Chromend K	Type 308	Rezistal KA-2-
309	25-12 309 Cb- 25-12 Cb	Stain-Craft HC (Stain-Craft 25/12 Cb)	Arcaloy Type 309 Arcaloy Type 309 Cb	Chromend HC Chromend 25/12 Cb Stainlend HC	Type 309 Type 309-CB	Rezistal No. 3 Rezistal No. 30
310	25-20	Stain-Craft HCN (Stain-Craft 25/20 Cb)	Arcaloy Type 310 Arcaloy Type 310 Cb Arcaloy Type 310 Mo	Chromend HCN Stainlend HCN Chromend 25/20 Cb Chromend 25/20 Mo	Type 310	Rezistal No. 7
311		Stain-Craft HN	Arcaloy Type 311	Chromend HN		Rezistal No. 4
312			Arcaloy Type 312	Chromend 29/9		
316	18-8 Mo		Arcaloy Type 316 Arcaloy Type 316 Cb	Stainlend K-Mo Chromend K-Mo Cb Chromend K-Mo	Type 316	Rezistal KA- 2SMO
317		Stain-Craft 18/8 Mo	Arcaloy Type 317	Chromend 18/8 Mo	Type 317	Rezistal KA- 2SMO
325		Stain-Craft 8/18				Rezistal No. 26
329		Stain-Craft 25/3 Mo	Arcaloy Type 329	Chromend 25/3 Mo		Rezistal No. 3
330		Stain-Craft 15/35	Arcaloy Type 330	Chromend 15/35 Stainlend 15/35	Type 330	Rezistal No. 3
347	19-9 Cb	Stain-Craft 18/8 Cb	Arcaloy Type 347	Chromend 19/9 Cb Stainlend 19/9 Cb	Type 347	Rezistal KA-2- SCB
403		Stain-Craft 12				
410			Arcaloy Type 410	Chromend 12	Type 410	Rezistal No. 1 Stainless Iron
430		Stain-Craft 16	Arcaloy Type 430	Chromend 16	Type 430	Rezistal No. 1 Stainless Iron
442		Stain-Craft 18	Arcaloy Type 442	Chromend 18		Rezistal No. 2 Stainless Iron
446		Stain-Craft 28	Arcaloy Type 446	Chromend 28		Rezistal No. 2 Stainless Iron
501		Stain-Craft 5M		Chromend 2M		Lo Cro 46 MO
502	4-6 Cr plus moly		Arcaloy Type 502	Chromend 5M	Type 502	Lo Cro 46 MO
Armor Plate			Armorarc Type A Armorarc Type B Armorarc Type N	Chromang		Armorize Armorize MN

Power	Westinghouse	Wilson Welder
	Flexarc Grade 18	17 & 18
RP	Flexarc AP	98N & 98N, V & O
C2		530
SP2	Flexarc FP & SW	107 & 108
C2	Flexarc FP & SW	520 & 520A
FF	Flexarc DH	105 & 106
C2	Flexarc DH	
HT		Alloyrod A—carbon moly
		582—carbon moly
	Flexarc FP & SW	
		Alloyrod B—carbon moly

Table II *Comparable S*

AISI No.	Air Reduction	Allied Weld-Craft	Alloy Rods	Arcos	Champion Rivet Co.	Crucible Steel	Harnischfeger
301X				Chromend 16/7			
302		Stain-Craft K				Rezistal No. 2-C	
302B		Stain-Craft KS					
303		Stain-Craft K					
304							
306							
308	19-9		Arcaloy Type 308	Stainlend K Chromend K	Type 308	Rezistal KA-2-S	Harstain 18-8
309	25-12 309 Cb-25-12 Cb	Stain-Craft HC (Stain-Craft 25/12 Cb)	Arcaloy Type 309 Arcaloy Type 309 Cb	Chromend HC Chromend 25/12 Cb Stainlend HC	Type 309 Type 309-CB	Rezistal No. 3 Rezistal No. 3CB	Harstain 25-12
310	25-20	Stain-Craft HCN (Stain-Craft 25/20 Cb)	Arcaloy Type 310 Arcaloy Type 310 Cb Arcaloy Type 310 Mo	Chromend HCN Stainlend HCN Chromend 25/20 Cb Chromend 25/20 Mo	Type 310	Rezistal No. 7	Harstain 25-20 Harstain A 25-2
311		Stain-Craft HN	Arcaloy Type 311	Chromend HN		Rezistal No. 4	
312			Arcaloy Type 312	Chromend 29/9			
316	18-8 Mo		Arcaloy Type 316 Arcaloy Type 316 Cb	Stainlend K-Mo Chromend K-Mo Cb Chromend K-Mo	Type 316	Rezistal KA-2SMO	Harstain 18-12-2Mo
317		Stain-Craft 18/8 Mo	Arcaloy Type 317	Chromend 18/8 Mo	Type 317	Rezistal KA-2SMO	Harstain 18-12-3Mo
325		Stain-Craft 8/18				Rezistal No. 2600	
329		Stain-Craft 25/3 Mo	Arcaloy Type 329	Chromend 25/3 Mo		Rezistal No. 329	
330		Stain-Craft 15/35	Arcaloy Type 330	Chromend 15/35 Stainlend 15/35	Type 330	Rezistal No. 330	
347	19-9 Cb	Stain-Craft 18/8 Cb	Arcaloy Type 347	Chromend 19/9 Cb Stainlend 19/9 Cb	Type 347	Rezistal KA-2-SCB	Harstain 18-8 C
403		Stain-Craft 12					
410			Arcaloy Type 410	Chromend 12	Type 410	Rezistal No. 12 Stainless Iron	
430		Stain-Craft 16	Arcaloy Type 430	Chromend 16	Type 430	Rezistal No. 17 Stainless Iron	Harchrome 16
442		Stain-Craft 18	Arcaloy Type 442	Chromend 18		Rezistal No. 20 Stainless Iron	
446		Stain-Craft 28	Arcaloy Type 446	Chromend 28		Rezistal No. 27 Stainless Iron	Harchrome 27
501		Stain-Craft 5M		Chromend 2M		Lo Cro 46 MO	
502	4-6 Cr plus moly		Arcaloy Type 502	Chromend 5M	Type 502	Lo Cro 46 MO	Harchrome 5
Armor Plate			Armorarc Type A Armorarc Type B Armorarc Type N	Chromang		Armorize Armorize MN	AW-3C

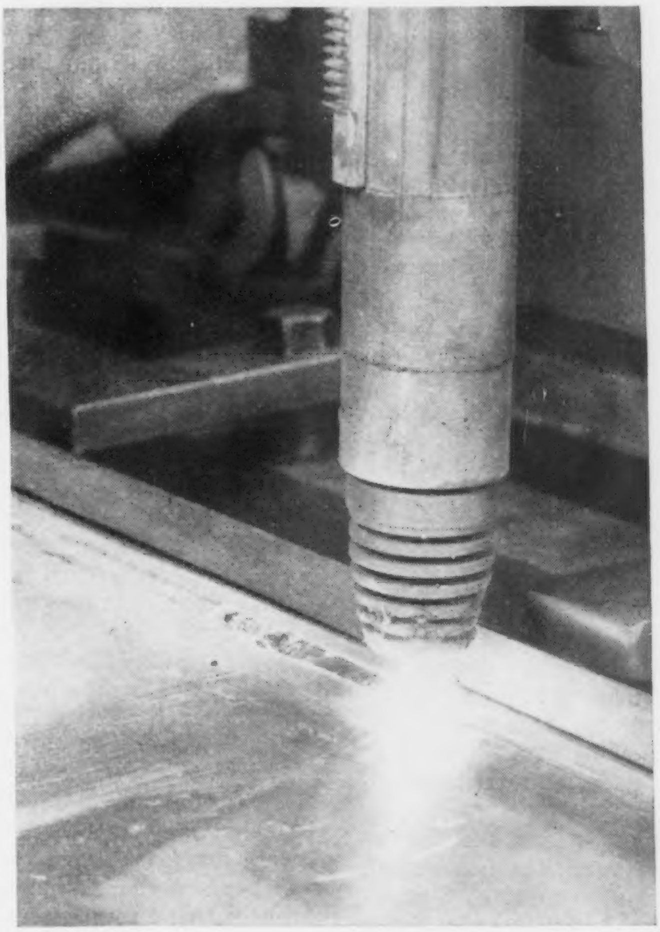
e Stainless Steel Electrodes

rnischfeger	Lincoln	Marquette	McKay	Maurath	Metal & Thermit	Page	A. O. Smith	Universal Power	Wilson Welding
	Stainweld A7		18-8					Stainarc A	
				Type 302-B				Stainarc F	
			18-8						
	Stainweld A7		18-8	Type 304	Murex 19-9			Stainarc A	
tain 18-8	Stainweld A7	Type 308	18-8	Type 308		Page Allegheny 18-8, Type 308	SW-162		19-9
tain 25-12	Stainweld B	Type 309 Type 309 Cb	25-12 25-12CB	Type 309 Type 309 Cb		P-A 25-12, Type 309	SW-166 {SW-167 (309 Cb)	Stainarc G (309 Cb)H	25-12 309 Cb-25-12 Cb
tain 25-20 tain A 25-20	Stainweld D	Type 310 Type 310 Cb Type 310 Mo	25-20	Type 310	Murex 25-20 Type 310 (AC-DC)	P-A 25-20, Type 310	SW-159	Stainarc L	25-20
				Type 311				Stainarc I	
				Type 312					
stain 18-12-	Stainweld C	Type 316 Type 316 Cb	18-8 Mo (316)	Type 316 Type 316 Cb	Murex 18-8 Mo	P-A 18-8 Mo, Type 316	SW-160	Stainarc C (316 Cb)E	18-8 Mo
stain 18-12-	Stainweld C	Type 317	18-8 Mo (317)	Type 317		P-A 18-8 Mo 3 to 4 pct, Type 317	SW-161	Stainarc D	
				Type 329				Stainarc S	
		Type 330	15-35	Type 330		P-A 15-35, Type 330			
stain 18-8 Cb	{Stainweld AS-Cb Stainweld A7-Cb	Type 347	18-8 Cb	Type 347	Type 347 (AC-DC)	P-A-18-8 Cb, Type 347	SW-157	Stainarc B	19-9 Cb
			12 Cr	Type 403					
		Type 410	12 Cr	Type 410		P-A 12 pct Chrome, Type 410	SW-153	Stainarc M	
chrome 16 Cr		Type 430	16 Cr	Type 425 Type 430		P-A 16 pct Chrome, Type 430	SW-154	{Stainarc O Stainarc U	
		Type 442	18 Cr	Type 442				Stainarc P	
rchrome 27 Cr		Type 446	28 Cr	Type 446		P-A 23 pct Chrome, Type 446		Stainarc R	
	Chromweld 4-6								
rchrome 5	Chromweld 4-6		5 Cr-Mo	{Type 502 Type 502-Cb Type 502-Cb-Mo		P-A 4-6 pct Cr with Mo, Type 502	SW-151	Stainarc Z	4-6 Cr plus moly
/-3C	Armorweld		A-6 (Mo) A-8 (Mn) 5-AM (Mn)		Murex 199 Mn	Type 307	SW-164		

satisfactory weld was greater than four times the sheet thickness, the latitude of machine adjustments was large, a large number of welds could be made between tip cleanings, and consistency of size and strength was very good. Whenever the slug diameter was less than four times the sheet thickness, latitude of machine adjustments became narrow, tip cleaning was necessarily frequent, and consistency of size and shape were not always as good as desired. Although any value between four and six times the sheet thickness is apparently conductive to good welding conditions, welds greater than four times the thickness require larger magnitudes of heat and pressure, and have been found to be unnecessary as far as strength is concerned. Roughly 3.5 times the sheet thickness has been observed to be the absolute minimum size of weld that can be made without causing some factors to become extremely critical, although this holds true more for the strong alloys than for the softer ones.

The second assumption was made merely with the thought that nearly all processes in nature conform to certain laws, and that changing dimensions of the material being welded should theoretically not have any effect on the weldability of the material, but only on the magnitude of the controlling factors.

It has long been observed that welds on 0.04-in. thick material seemed to be the easiest to produce with the widest latitude of machine adjustments on so-called standard size machines. They were mostly very consistent in both size and shape, and gave a minimum amount of tip pickup. Also, because 0.040 lies almost in the center of the operating range of most standard equipment, it was felt that the assumption of using the magnitudes of all factors which produced optimum welds on this thickness would not be far from wrong. Assuming finally that all current passes through and all applied force acts upon a cylinder of metal which lies between the two electrodes, and which is the same diameter as the diameter of the weld slug, the following laws may be said to apply:



HELIARC welding, using an argon gas protective atmosphere and high frequency current superimposed on the normal frequency, has made possible improved welding of stainless steel.

(1) The pressure required and exerted by the electrodes upon the sheets being welded is constant regardless of the thickness for optimum welds. This means that the electrode force required is proportional to the weld area, or to the square of its diameter.

(2) The resistance of the weld zone or the cylinder of metal between the faces of the electrode tips is proportional to the thickness.

(3) The total heat required to produce a weld slug of a given diameter is proportional to the cube of the thickness.

(4) The welding time is directly proportional to the thickness.

(5) The secondary peak current required for welding is proportional to the 3/2 power of the thickness.

(6) The shear strength is proportional to the shear area of the weld slug.

(7) The electrode diameter required in order that the temperature rise in the electrode be the same for all thicknesses, is directly proportional to the thickness.

(8) Spot facing and edge distance are both directly proportional to the thickness.

(9) The tip radius for dome tips is directly proportional to the thickness.

The slug diameter has been found not to be a function entirely depending on the amount of current used, but rather is determined by the correct relative magnitudes of all factors. If, for instance, an optimum weld is made having $d = 4h$ and an attempt is made to produce a weld where $d = 3.5h$ by reducing the current, leaving all other factors constant, it will be found that the penetration is reduced by a much higher percentage than the diameter, and the consistency of successive spots suffers considerably. On the other hand if a good weld where $d = 3.5h$ has been produced with certain machine settings and an attempt is made to enlarge it to $d = 4h$, by increasing the current, the result again will be to increase the penetration more than the diameter, and to initiate cracking and porosity within the slug.

Machine settings and the magnitudes of many of the above factors currently used in production do not conform to the above laws except in cases where the thickness being welded lies in approximately the center of the total welding range of the machine being used. This is not an indication that the laws cannot be applied practically, but rather it is an indication that some of the thicknesses are being welded on machines at a low degree of efficiency. In other words, the thicknesses which lie toward the low end of the range of a machine usually are welded with considerably too much pressure and heat because of the lack

(CONTINUED ON PAGE 278)

FOUNDRY

NOW it is gray iron's turn for the spotlight. This is shown by the upswing in demand for gray-iron and malleable-iron castings, which has been mounting month after month since V-J day. At the same time, there has been a sharp drop in output of magnesium and aluminum castings, and a lull in demand for steel castings.

Gray-iron foundries look to produce at a rate much greater than the present 10,000,000 tons a year, perhaps as much as 13,000,000 tons, which will be a definite impetus to production of the many peacetime products which are in such short supply.

Since the war ended, gray-iron castings have been major bottlenecks in the production of domestic appliances, automobiles, homes, plants, office and service equipment. Inadequate supply of castings is also felt in the fabrication of machinery and equipment for industries such as textile, leather, farm, food processing, coal, oil field and construction. As an example, there is the textile industry attempting to build new machinery to meet the demand for nylon goods. The construction industry is calling for more castings to build machines for the many new building materials that research has devised over the past few years, and a recent drop in production of agricultural machines and tractors has been definitely attributed to the lack of gray-iron castings.

All told, there is a backlog of at least six months ahead for the entire industry, and for automobile castings alone there is an estimated backlog of about eight months' production. Potential business, stressed by prevailing urgencies, ought to occupy the existing casting plant for four or five years.

On the other hand, since war's end the slackening in the demand for castings in the light metals is shown clearly by production figures. The extent of the decrease in demand, particularly in magnesium, is reflected in complete magnesium foundries on the list of surplus properties.

There is no doubt but what war experience will tend to modify the viewpoint of designing engineers as to the application of diecastings. Due to the fact that screw-machine equipment was wholly inadequate to meet war needs, thousands of various types of parts that were normally considered screw machine products were produced by the diecasting method, and it was found that in many instances favorable production costs resulted. A similar situation was encountered with certain types of stampings due to shortage of sheet metals and stamping equipment. Indications are that with lower base costs of aluminum and magnesium, there may well be an increase in the production of diecast parts produced from the lighter metals.

THE copper-base nonferrous foundries have increased production from a prewar level of 250,000 tons to more than three times that figure at the beginning of 1945. Mechanization of existing plants and new facilities for specialized types of castings have helped to meet the crippling lack of labor. The brass and bronze foundrymen widely applied centrifugal casting and precision-casting techniques, which they are continuing to use to help meet demands for highly specialized components.

In the steel-casting industry a larger capacity was created during the war period, most of the new capacity being government owned and special in character for ordnance items. Given necessary time for reconversion and reestablishment of markets, steel foundries look for invasion of new markets as ordnance know-how is translated into peacetime production. Although faced with a difficult job in obtaining common labor, the steel-casting industry is already in a position to accept more tonnage, and with electric-steel capacity greatly expanded, it is anticipated that this capacity is more than sufficient for the high-grade alloys and therefore is likely to be used for more common grades, a practice inconceivable during the war.

Although malleable castings had a big decline in orders and production right after the ending of hostilities in Germany, in the month following victory in August the demand has been on the upgrade, coming largely for automotive and farm machinery builders. During the war a variety of mechanization programs were carried to completion. It is believed that even with manpower now available, the industry is in excellent shape to meet current demand.

Gray-iron castings hold the spotlight as foundries strive to lift production to meet record reconversion commitments. Meanwhile, precision casting promises to hold onto wartime gains, while aluminum and magnesium sand, permanent mold and diecastings drop far behind 1944 production peaks.

By J. ALBIN

Associate Editor

A major cause of the gray-iron casting shortage is the insufficient production of captive foundries, particularly the captive foundries owned by auto makers. In 1941 they were cut back to 25 pct of capacity, and three of the large companies completely shut down their foundries. It has been estimated that the auto industry procured at least half its gray-iron castings from outside sources before the war. Many captive foundries in other industries either suspended operation or turned to entirely different products when they took on war orders. Now the old foundry facilities are either unavailable or inadequately equipped to turn out light castings for consumer use, such as radiators and boilers. This situation is reflected in the growing volume of orders on the books of foundry-equipment manufacturers. Meanwhile, jobbing foundries are under great pressure to plug up all these gaps.

Manufacturers working on new lines or models are having a hard time, and in cases are complaining that they are not able to get any castings at all. At the same time old customers are able to get deliveries and in some instances are stockpiled.

The gray-iron industry could immediately absorb some 45,000 additional workers, the majority unskilled. Much has been said and written about plant conditioning during the past year, and the need for getting the gray-iron plan prepared for the peacetime production has been strongly emphasized. At the Gray Iron Founders Society's conference in Chicago last October, the different reasons for lost time on the part of foundry workers were said to be the common cold, sinusitis, tonsilitis, bronchitis and pneumonia. All have in their history the exposure of the worker to sudden and extreme changes in temperature. An instance of exposure to change in temperature quite common in foundries is when a worker will leave a hot pouring operation to go outside of the building to mix sand in wintertime. Several simple steps have been suggested for lessening the sweep of cold drafts through the plant. One recommended procedure is that plant doors should be protected on the outside by canvas baffles where doorways of necessity must be kept open. Loading and unloading operations should be done either within the plant or at an outside dock, but never with a truck backed halfway through the doorway.

Improved Ventilation Very Desirable

It has been definitely shown that an improvement in ventilation can contribute to a decrease in manhours per ton in molding departments. In the several instances described at the Gray Iron Founders meeting, the pouring and shaking-out operations before ventilation systems were installed resulted in a gas and dust condition that caused lower production and high labor turnover. In fact, it was extremely difficult to get sufficient help to do pour, shift and shake-out work.

The hazard of silicosis is not as bad as portrayed. Black molding sand, because it cloaks every worker with its black film and characteristic odor, handicaps the industry in its effort to secure apprentices. But the instance of silicosis in the foundry industry, which often has been advanced by workers as a reason for leaving or not taking jobs in foundries, is statistically not as great as in other industrial work.

Foundry-equipment manufacturers, as well as air-conditioning concerns, have been giving special attention to the problem of dust suppression and type of ventilation suitable for foundries. In deciding on the extent of dust suppression or air-conditioning equipment to be installed in the foundry, it is well to remember that the accepted safe dust count is below 5,000,000 particles per cu ft of air, and a hazardous

dust must contain particles below a certain diameter and contain more than 15 or 20 pct of free silica.

Important as the dust problem is to the foundry worker within the plant, another aspect of the dust problem is being given attention, that is to meet the complaint that foundries pollute the surrounding atmosphere. Thinking again in terms of worker shortage, and of attracting new recruits to a particular foundry located in a particular location, new types of equipment effectively reduce area pollution.

Mechanization is usually advanced as another means of attracting more and better personnel into the foundry, as well as cancelling production bottlenecks and dropping high unit costs. Many foundrymen view mechanization as a thorough transformation desirable in itself, but a transformation requiring specific methods for specific plants. First of all, a foundry functions as a closely knit organization, affected not only by the machines and equipment, but also sensitive to sand, metal poured, the melting procedures and the type product made. Hence, after a process is selected, it is necessary to logically and consistently build around it. According to this philosophy, everything done in the foundry is related to everything else. Many variables are inter-related and each must be taken into consideration. One instance that is pretty well established in foundries, large or small, is that the use of mechanized aids in pattern rigging where the castings are small definitely results in lowering of cost and a satisfying increase in production.

Training Foundry Engineers

The training of men who can occupy positions on the engineering level in the foundry has been interrupted by the war to such an extent that many in the industry express genuine alarm. Spokesmen of professional organizations in the foundry industry believe that their industry exhibits the spectacle of too many engineers becoming discouraged and discontinuing their foundry careers because management was concerned particularly with immediate production problems and not interested in building an organization to meet future challenges. In order that the foundry industry may enter into successful competition for the young engineers of tomorrow, several lines of action are recommended. The first is that assistance be given to educators and educational counsellors and all others who are in a position to influence the thinking of young men vocationally to understand that there is an opportunity for engineers to enter the foundry business. A second approach recommended is that the industry adopt a program of direct recruitment in the schools and colleges in a manner that has been successfully pursued by other professions which have experienced the same kind of personnel shortage. It has also been pointed out that in most colleges and universities with a foundry for instruction purposes, the student finds a rather unattractive laboratory, a shop showing little evidence that the industry has applied modern and scientific methods to the product made or to the working conditions under which it is producing. Judging by these replicas of foundries, the student pictures an industry with poor working conditions, low pay and an unimaginative concept of the application of engineering principles. Foundries can do much to stimulate interest by working with the schools and colleges in the revamping of their foundry equipment to a level more comparable with practices of the advanced and progressive foundries.

All this involves long-range programs in which the American Foundrymen's Assn., the Gray Iron Founders Society and the National Founders Assn. are actively engaged.

Melting Equipment In Demand

According to figures of representative foundry-equipment manufacturers, a sharp increase in sales has taken place since August, the figure for the month of November being twice the figure representing the average monthly sales for previous months. Most in demand are cupolas, blowers and other equipment which go into gray-iron foundries.

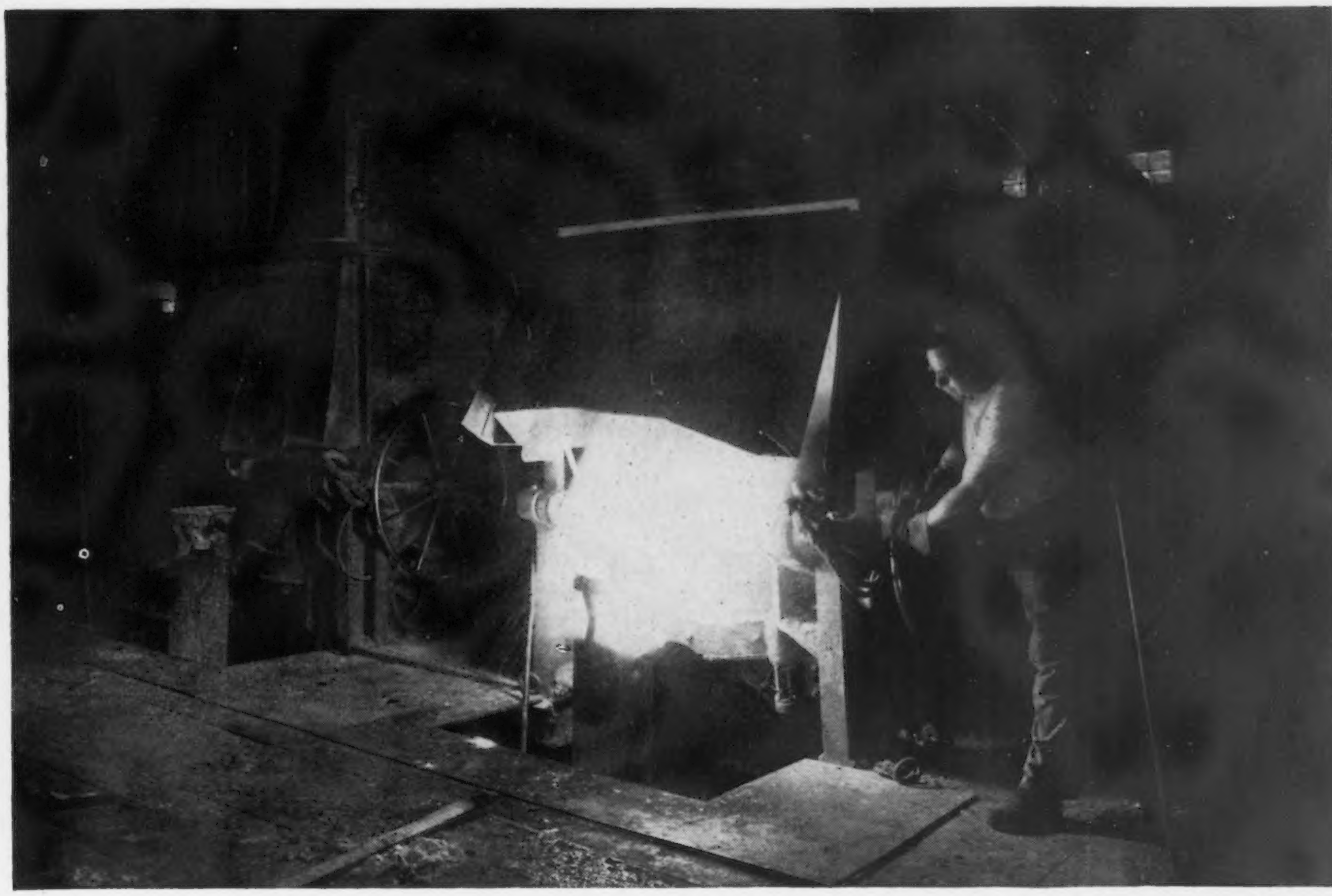
Increasing interest is being shown in blast control, hot blast and dry-blast equipment. Better blast control, a favorite story of the British Cast Iron Research Assn., is being integrated into American production with certain improvements, as for instance automatic control of tuyeres which minimizes local freezing of slag. Greater demand for continuous-melting equipment in malleable foundries has been evidenced. The larger foundries are duplexing with cupolas and air furnaces or cupolas and electric furnaces, but the smaller foundries favor different types of continuous melting. It has been found that pulverized coal for the firing of air (or reverberatory) furnaces gives higher temperatures, lower oxidation losses and lower refractory loss. In line with the demand by smaller foundries for continuous-melting rotary furnaces, one equipment manufacturer is bringing out this type of furnace with capacities under 5 tons per hr (minimum 1000 lb). This furnace is satisfactory for malleable, low carbon (under 3 pct) high-test gray-iron and nonferrous metals.

Mechanical charging is growing in popularity, manpower economy being the critical fact that it is, and there results an elimination of hazards, better charge distribution and, consequently, better metallurgical control. One manufacturer is making a swivel machine that will charge two cupolas simultaneously out of a battery of three or four cupolas. Materials handling and charge makeup equipment have been improving step-by-step with mechanical charging. A new development in annealing is the hood-type annealing oven. One such oven is of the full-fired hood type where the casting charge can be elevated into the hood by use of a combined transfer car and hoist.

Many foundries contemplate large expenditures for new equipment to minimize heavy labor, and the influence of war work has hastened automatic control of operation cycles. The International Molding Machine Co. of Chicago is developing a new automatic multiple molding unit to help increase the production of foundry castings. In a setup being installed by General Electric at Elmira, New York, and Westinghouse of Cleveland for the making of electric motor brackets, it will be possible to have a production of one flask every 12 sec. five or more brackets to a flask. Each of the steps is automatically controlled through an automatic panel board with electric timing devices.

Gray Iron Research Increasing

The growing insistence on quality is being felt in the gray-iron industry. Dimensional accuracy, internal soundness and greater strength and ductility are in demand. Castings have usually been priced so low that little margin is generally left to pay for the research so generally needed. Some of the problems which face the gray-iron industry are:



COMPLETE absence of smoke and fume when melt is poured results from the use of a fume removal system manufactured by B. F. Sturtevant Co. Division of Westinghouse Electric.

(1) The relation of risers to soundness of castings requires more study. X-ray work has already shown the need for larger iron castings than for similar steel castings because of the late feed demand of iron.

(2) The stresses are as perplexing and serious in iron castings as in steel and it is certain that stress-relieving cycles will have to be accurately determined. Research will establish the necessary data to enable complete and dependable stabilization of even large castings in a matter of hours.

(3) Use of inspection tools, including X-ray, in the acceptance of iron castings for critical service.

(4) Much more work remains to be done in graphitization, chill characteristics, segregation and control of microstructure.

(5) Additional investigation of heat treatment of irons, not only to determine stress-relief cycles but to improve microstructure.

(6) Intensified research on the naturally-bonded sands may lead to their improvement, or a blending of natural and synthetic sands may prove desirable.

Precision Casting Has Promise

The wartime success in casting turbosupercharger buckets has tended to color the peacetime application possibilities of precision casting. It is believed that the process had a peacetime economic base where parts are to be cast in quality alloys difficult to work or fabricate by conventional methods. Stellite and Vitalium for high-temperature service are instances of metals cast to high tolerances, which lend themselves to grinding as the only other possible method of fabrication.

Some foundries have resorted to precision castings simply because it was not known whether a certain part could be made by any other method. The unit cost may have appeared high, but nevertheless the designer was satisfied that he could include a part in his product made of a shape and material exactly as he desired. One pump manufacturer resorted to precision casting in order to make a rosette-shaped impeller for a tiny pump of high capacity used in a bomber. Although the impeller was made of aluminum, the shape was such as to discourage production by conventional machining methods. The metal and shape of the particular part are the two factors determining the economic feasibility of the process.

During the past year much research went into metals in connection with precision casting. Steel rifle parts have been successfully made by this process. Grain size can be controlled to obtain desired physical properties, and the cast structures have favored long service life.

Many desired components can be fabricated economically by casting the newer quality alloys such as Hastelloy nickel-base alloys which were developed for resistance to chemical corrosion. These show outstanding resistance to such corrosive media as hydrochloric acid, hot sulphuric acid and wet chlorine. They also have exceptional physical and chemical properties in high temperatures. Now with the aid of the precision casting process, parts such as spray-nozzle caps, spray-nozzle bodies, injector nozzles, have been used in equipment to handle corrosive chemicals. Again, the shape, dimensional tolerances and the hardness of the material present a combination practically impos-

(CONTINUED ON PAGE 272)

ORE AND

While a manpower shortage curtailed production and development work in underground mines, 1945's total output of 89,400,000 tons was another triumph for the iron ore industry. This great output is a sober reminder that additional expansion of ore-beneficiation facilities cannot come too soon.

A GREAT wartime record, practically five years of iron ore production and transportation well beyond any conceivable prewar potential, was concluded in 1945 with the loading of the season's final cargoes of Lake Superior district iron ore at Escanaba and Superior docks, Dec. 5.

Total iron ore shipments from all mines in the U. S. amounted to approximately 89.4 million gross tons, of which the Lake Superior district produced 76.0 million tons, or 85 pct; the Southern district (principally Alabama) 6.8 million tons, or 7.6 pct; the Eastern district (New York, Pennsylvania and New Jersey) 3.5 million tons, or 3.9 pct; and the Western States 3.1 million tons, or 3.5 pct. (See table I.)

Canadian ore output in 1945 was about equally divided between the Helen mine in the Michipicoten district and the new Steep Rock mine near Atitoken. Since the much-heralded new ore dock at Port Arthur, Ontario, was not completed for loading Steep Rock ore until late in the season, some 352,000 tons of this ore moved to Superior, Wis., docks, which had shipped Steep Rock's small output in 1944.

While the Canadian portion of Lake Superior iron ore output is an integral part of the entire district production, and some of it moves to furnaces in the U. S., a much larger tonnage of U. S. ore supplies the Canadian furnaces; of the total Canadian consumption approximately 2,500,000 tons in 1945, more than 85 pct came from U. S. mines.

During the last five years, the Lake Superior district shipped more than 420,000,000 gross tons of ore, or nearly 18.5 pct of the total output of the district since it was opened about 1850, which totals about 2,277,000,000 tons. Average shipments in the last five years have exceeded 84,000,000 tons annually, of which the Mesaba Range alone supplied more than 75 pct. (See table II.)

Additional important data on Lake Superior ore for each of the past five years, including the lake movement and shipments all-rail, both U. S. and Canadian, ore consumption of U. S. and Canadian furnaces, and stocks of ore available to furnaces on May 1 and Dec. 31 each year, are shown in table III.

It should be noted that while shipments peaked in 1942, consumption did not reach its maximum until 1943, and stocks at furnaces and Lake Erie docks their minimum (since May 31, 1937) until May 1, 1945. It is unnecessary to add, however, that iron and steel production has never been menaced by any possible ore shortages.

OF considerable significance to iron-ore operators in recent years is an analysis of the relationship between the volume production of pig iron and steel and the tonnages of ferrous scrap and pig iron consumed, since the amount of iron ore required is definitely related to the volume of ferrous scrap available to the furnaces.

Purchased scrap is an item of particular importance in relation to the ore requirements during the war years, for at no time could scrap supplies be anticipated indefinitely. In some quarters it was felt the supply would decline steadily after 1941, especially after considering the substantially smaller amounts which had been produced in previous years. Approximately 26,000,000 net tons of scrap were consumed in 1945, equivalent to 1944, together with 31,000,000 tons of home scrap and 55,000,000 tons of pig iron, in producing an estimated 78,500,000

COAL

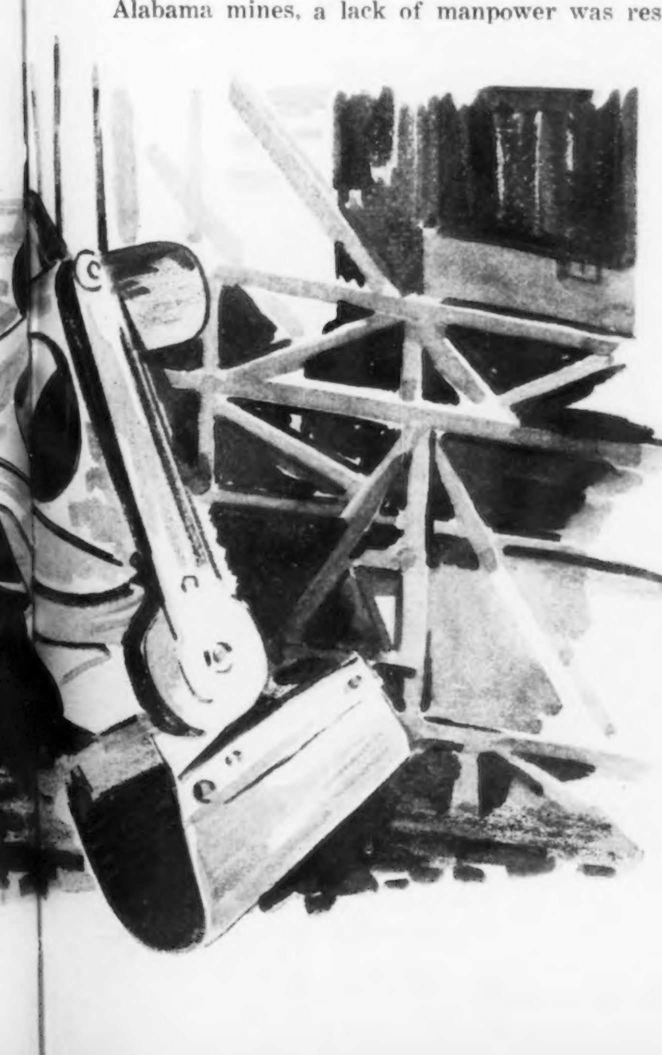
By W. A. LLOYD
Cleveland Regional News and Markets Editor

net tons of steel plus direct products of iron melting furnaces.

That purchased scrap consumption could be maintained at 26,000,000 tons or more in each of the past four years, about six to eight million tons more than many observers felt would be available annually, was of great importance to the war effort in alleviating the burden on iron ore mines and blast furnaces of the country.

Throughout the United States iron ore production was burdened by a manpower shortage, both skilled and unskilled. The available labor force in the Lake Superior district was slightly under 20,000 at the start of the shipping season, compared with a force of 21,600 at mid-season in 1944. Although some additional labor became available later, it was never possible to release from production men needed to carry on the development work in underground mines which has been, according to operators, badly neglected during the entire war.

Manpower handicapped other districts, notably the Southern and Eastern, and production was, consequently, somewhat less than had been anticipated. As shown in table I, eastern district ore output was not increased over 1944 despite new plant capacity available from installations made in the previous year. In Alabama mines, a lack of manpower was responsible for the decline in output and for the shipment in late 1945 of sizeable tonnages of Lake Superior iron ore from stocks in the Chicago district to augment local supplies at some Alabama furnaces. Additional shipments may be made to the South during the winter unless the labor situation there improves. According to operators, some recent additions to the labor force have been made from returned servicemen and other sources, and it is hoped that 1946 operations may proceed on a more balanced schedule with proper attention possible to development and maintenance, which have been neglected in recent years.



IN 1945, Minnesota's Mesaba supplied, as has been its custom, more than 75 pct of the total Lake Superior output for the season; the other five ranges included in the United States side of the district supplied about 22 pct. Largest among these was the Marquette, and next, in order, the Gogebic, the Menominee, the Cuyuna and the Vermillion. Other than the Cuyuna range which now has one underground mine, most operations on the other ranges are underground.

Output of the Michipicoten district in 1945 came from the Helen mine of Algoma Ore Properties, Ltd. The Josephine-Ruth property, owned by Sherritt-Gordon and Frobisher Exploration Co., Ltd., was expected to get into production, but no shipments were made from it.

During the year, Steep Rock had physical difficulties, including a shortage of labor, excessive rainfall, slides in soft overburden, and other handicaps which affected its anticipated output appreciably, especially in the "B" orebody pit. With a heavy winter stripping program, reportedly under way, a sharp increase in output is expected in 1946.

In the eastern district, the Cannon and Peters mines at Ringwood, N. J., recipient of a government expenditure of some $4,000,000, were expected to get into production by Alan Wood Steel Co., in 1945. However, DPC withdrew support from this undertaking before it was completed since it was not needed for the war effort, and its future is considered uncertain. Alan Wood Steel Co., largest New Jersey operator, was active at its three mines, Washington, McKinley and Scrub Oak. Warren Pipe & Foundry Co. operated the Mt. Hope mine, where the new 2600-ft shaft is the deepest and largest in the state.

Elsewhere in the East, Republic Steel Corp. operated its "Don B" and Fisher Hill mines near Mineville, New York, and the Chateguay mine at Lyon Mountain. Jones & Laughlin Steel Corp. operated its Benson mines open-pit throughout the year and the M. A. Hanna Co., its Clifton mine, where the operation was changed from open-pit to an entirely underground operation. In Pennsylvania, Bethlehem Steel Co. operated its large Cornwall magnetite operation as usual.

In the South, Sheffield Steel Co.'s new blast furnace

Table I—U. S. Iron Ore Shipments* By Producing Districts

District	1941		1942		1943		1944**		1945***	
	Gross Tons (Millions)	Pct Total	Gross Tons (Millions)	Pct Total	Gross Tons (Millions)	Pct Total	Gross Tons (Millions)	Pct Total	Gross Tons (Millions)	Pct Total
LAKE SUPERIOR Minnesota, Michigan and Wisconsin	80.75	86.54	93.01	87.10	85.98	85.85	81.86	85.52	76.0	85.0
SOUTHERN Alabama (and Georgia, Virginia, Texas and Missouri)	8.16	8.75	9.21	8.63	8.53	8.52	7.40	7.73	6.8	7.6
EASTERN New York, Pennsylvania and New Jersey	3.00	3.21	3.08	2.88	3.19	3.18	3.50	3.66	3.5	3.9
WESTERN Wyoming, Utah, California, New Mexico, Arizona and Washington	1.40	1.50	1.48	1.39	2.45	2.45	2.96	3.09	3.1	3.5
Total	93.31	100.00	106.78	100.00	100.15	100.00	95.72	100.00	89.4	100.00

* Exclusive of by-product pyrite cinder and sinter from various sources.
** Sources: U. S. Bureau of Mines, Lake Superior Iron Ore Assn., and others.
*** Estimated on Dec. 1.

at Houston was shut down in August 1945 and the DPC Lone Star furnace at Dangerfield has never been completed and it is understood that a governmental economic survey of this project is being made. Some limonite ore from the Lone Star concentrating plant moved to Houston and Alabama furnaces early in the year. Sheffield Steel's mine operations in both north and south basin limonite ores supplied some of its blast furnace requirements, and additional ore was imported from Mexico. Florida's small Pembroke (phosphorus) furnace was moved to Rusk, Tex.

In the West, the new shaft and surface plant at the Colorado Fuel & Iron Co.'s Sunrise mine (the only iron mine in the country where block caving is

Table II—Mine Shipments of Lake Superior Iron Ore During Five War Years

To Lake Ports and All-Rail—In Gross Tons

	1941	1942	1943	1944	1945 (a)	Five Years 1941-1945, Inclusive		
						Total	Average Per Year	Pct of Total
U. S. RANGES								
Mesaba	59,722,543	70,280,087	64,906,280	62,509,212	59,065,100	316,533,222	63,306,644	75.29
Vermillion	1,847,094	1,924,877	1,779,014	1,538,560	1,395,600	8,485,145	1,697,029	2.02
Cuyuna	2,441,042	3,035,532	3,065,555	2,538,492	2,363,000	13,443,621	2,688,724	3.20
Total Minnesota	64,060,726*	75,299,667*	69,971,276*	66,586,264	62,823,700	338,741,633	67,748,327*	80.57*
Gogebic	6,301,379	6,237,894	5,486,918	5,604,354	4,310,400	27,940,945	5,588,189	6.65
Marquette	6,254,391	6,540,731	5,601,418	4,790,177	4,531,000	27,717,717	5,543,543	6.59
Menominee	4,131,363	4,930,434	4,902,556	4,876,210	4,295,600	23,136,163	4,627,233	5.50
Total Mich.-Wis.	16,687,133	17,709,059	15,990,892	15,270,741	13,137,000	78,794,825	15,758,965	18.74
TOTAL U. S. RANGES	80,747,859	93,008,726	85,962,168	81,857,005	75,960,700	417,536,458	83,507,292	99.31
CANADIAN RANGES								
Michipicoten	462,747	486,666	450,973	482,083	496,700	2,379,169	475,834	0.57
Steep Rock	....	....	....	16,552	490,000	506,552	(101,310)	0.12
Total Canadian	462,747	486,666	450,973	498,635	986,700	2,885,721	577,144	0.69
TOTAL Lake Superior	81,210,606	93,495,392	86,413,141	82,355,640	76,947,400	420,422,179	84,084,436	100.00

* Includes some ore from S.E. Minnesota also.
(a) Subject to correction when final figures are available.
* Courtesy Lake Superior Iron Ore Association.

Table III—Lake Superior Iron Ore Shipments in Relation to Consumption, and Stocks on Significant Dates**
(In Thousands of Gross Tons)

	1941	1942	1943	1944	1945
SHIPMENTS					
By Lake					
From U. S. Lake Ports	79,655	91,004	83,961	80,691(a)	75,110(b)
From Canadian Lake Ports	461	473	444	479	605
Total by Lake	80,116	92,077	84,404	81,170	75,715
All-Rail					
From U. S. Mines	1,094	1,396	2,016	1,183	1,203*
From Canadian Mines	......	14	1	......	30*
Total All-Rail	1,094	1,410	2,017	1,183	1,233*
TOTAL SHIPMENTS	81,210	93,487	86,421	82,353	76,947*
ORE CONSUMPTION					
By U. S. Furnaces	74,571	83,714	86,585	84,734	72,280*
By Canadian Furnaces	1,765	2,511	2,442	2,513	2,370*
TOTAL CONSUMPTION	76,336	86,225	89,028	87,247	76,650*
STOCKS ON HAND					
U. S. and Canadian					
At Furnaces and Lake Erie Docks					
On May 1	16,937	20,065	18,497	17,892	16,429
On December 31	40,457	47,424	43,429	37,824	38,500*

* Partly estimated.
** Source: The Lake Superior Iron Ore Association.
(a) Includes 16,411 tons Canadian ore loaded at Superior, Wis.
(b) Includes 352,033 tons Canadian ore loaded at Superior, Wis.

practiced) was completed and gotten into operation in 1945. Located in eastern Wyoming, this mine increased its output during the war to about 1,000,000 tons annually. CF&I is reported to have developed another large ore body by diamond drilling in the immediate neighborhood of the present mine.

Colorado Fuel & Iron operated its Duncan mine at Cedar City, Utah, under contract most of the year. The mine was opened originally in 1943 to meet the war demands of blast furnaces at Pueblo, Colo.

Henry Kaiser's Fontana plant continued to receive ore from the Vulcan mine in the Kelso district in San Bernardina County, Calif. and from southwestern Utah. Kaiser Co. is reported to have purchased several iron ore claims from the Colorado Fuel & Iron Co., near the Vulcan mine. The company has definitely acquired an ore deposit at Silver Lake, and the sizeable Eagle Mountain deposit in Riverside County is expected to go under the Kaiser aegis shortly.

TOTAL ore imports from all sources, based on incomplete data, are estimated at about 1,000,000 tons. Included was about 150,000 tons of iron ore from Algeria which came into the eastern seaboard throughout 1945, and several large cargoes from Chile were received beginning in August. Also, a few thousand tons from Mexico were received at Houston, Tex. Largest imports, of course, were from Canada—far larger than usual because of the Steep Rock output.

Contrary to the expectation that Brazil would ship some ore to this country—since the U. S. loaned the money to rehabilitate the railroad from Victoria to the mines and for the dock at Victoria, all that was shipped from there, approximately a million tons, seems to have gone to Great Britain.

Another foreign source of iron ore is the extensive development by Bethlehem Steel Co. of a large open-pit high-grade direct shipping hematite mine in Venezuela, the El Pao mine at San Felix. It is reported that plans call for the eventual output of 2,000,000 tons to be shipped to the United States. The project, begun in 1940 and interrupted by the war, is being pushed to completion. Several large new ore carriers of 25,000 gross tons capacity are available for this haul.

The year 1945 witnessed additional expansion of facilities for washing and concentrating substandard ores. In the Mesaba, the new plant at Inter-State Iron Co.'s Columbia mine near Virginia, opened experimentally in 1944, got into full production in 1945. A new washing plant at the Hanna Co.'s Wabigon mine at Buhl was finished and put into operation and a second one for "heavy medium" separation was added to Butler Bros.' Patrick plant at Cooley.

There are now four plants in the Mesaba range making effective use of this so-called "hi-density" process in conjunction with other ore concentration processes. At the same time, treatment of fine-size ore has been given increased attention and several washing plants are installing so-called "hydro-sizers" for recovering fines which formerly escaped.

Among the new installations of conveyor belts for moving ore from pits to surface loading hoppers or beneficiation plants are Interstate's new Hill-Annex conveyor, and another at the Oliver Co.'s Gross Marble mine, both on the western part of the Mesaba, and a long belt at the Kevin, which moves pit ore to Butler Bros.' Patrick plant.

At several company laboratories on the Mesaba,

[CONTINUED ON PAGE 274]

LAST year's scrap market was characterized by a dire shortage of practically all scrap grades in all steel-producing areas, except on the West Coast where scrap had an easy tone throughout the year. But, there is some indication that this exceptional condition in the West may not long prevail, particularly if proposed lowered intercoastal water rates go into effect.

It is the expectation of many in the trade that the scrap shortage will be prolonged through next year and may be expected to grow even worse unless a prolonged steel strike alters the situation. The statistics of the Bureau of Mines show that inventories of purchased and home scrap at plants of mills, dealers and producers have been growing smaller and smaller ever since the middle of 1943 and in the past year have well nigh reached the vanishing point.

During the year there was no fluctuation in the market price of heavy-melting scrap and, in general, other grades including blast-furnace have been maintained pretty close to ceilings all over. There was only one period in the early part of the year when certain consumers found it advisable to make a concerted attack on the market price. However, the maneuver failed largely because of the low inventories at the plants of consumers and the small amount of scrap available on the market.

Moreover, this was about the time that the OPA removed the springboard limitation on long distance scrap hauls and, since the Pittsburgh mills were in great need of supplies, they paid for shipping it all the way from the East, where the price move originated. Cast scrap has been extremely scarce all during the war, but recently there have been some slight indications of an improved supply position.

Recently there have been several factors in the market, operating by virtue of the acute shortage of scrap, seeming to elevate prices above ceiling levels. One is the willingness of mills to pay even as much as $2.50 per ton springboard above local ceiling prices. When the OPA regulation limited this payment to $1 per ton this movement did not of course represent such an inflationary trend. Now, however, it is a definite evidence of a market which would surge quickly above current levels if OPA controls were not continued. Another indication of the pressure of consumers on the market is the purchase by brokers and dealers of ordnance scrap at prices above ceiling levels. This practice is explained by the fact that the scrap is not prepared when bought and the ceiling prices are established to cover prepared scrap.

This, of course, does not indicate that market observers did not once or twice during the year anticipate a softening market, particularly after military victory. However, at that time the immediate military cancellations reacted at once on the turnings market by ending the supply of shell turnings, one of the most prolific sources of this material.

There has been a movement recently to make application to OPA for an increase in scrap prices in view of the pressure of high costs on yard overhead. However, some industry members are convinced that such a move will not be likely to succeed, not alone because of the reluctance of OPA to grant increases but also because the present ceiling prices are believed to be bringing out sufficient scrap, now that the war is over, to accommodate current relatively low ingot rates.

Scrap consumers have been anticipating a windfall when supplies of ordnance, maritime and contract termination scrap appear on the market in large volume.

Victory brought no easing of the pressure on the entire scrap list, and even the threats of strikes are unlikely to deflate a price structure pressing hard against ceiling levels. Foreign scrap, prepared ordnance stockpiling of alloy scrap and breaking-up of shipping are all factors of future interest.

By JOHN ANTHONY

Associate Editor

To date there has been only a dribble of scrap offered from these sources.

Contract termination surpluses, which would normally be expected to go into the scrap market, are being avidly gobbled up by the steel warehouses whose reserves are suffering from the uncertain steel future. There have been practically no surplus vessels sold by the Maritime Commission as scrap. Army surpluses sold as ferrous scrap during the last 17 months total 589,871 gross tons of industrial scrap and 329,902 tons of command scrap, while the Navy has sold 347,656 tons, a drop in the bucket.

A committee of ferrous and nonferrous scrap specialists including Edwin C. Barringer, Joel Claster, N. Ebersole and L. D. Greene went abroad to inspect European battle and ordnance scrap under the auspices of the Army Service Forces. While there have been no reports published of the recommendations of this committee, it is fairly obvious that there is little likelihood of the return of significant quantities of scrap, sufficient to affect the supply situation or depress the present market structure.

BARRING the possibility of a decision by government as to disposition of the entire fleet of commercially-impractical liberty ships or to jettison some of the older naval vessels, the belief prevails that there is practically no possibility of a market slump next year despite the deflationary pressure of the impending steel strikes. For the long term, the scrap trade looks toward the steel industry to gage prospective demand. Since the industry, aside from the labor-management difficulties, is optimistic in market viewpoint covering the long term, the opinion may be hazarded that there need be little or no concern over a market slump in scrap over a still greater period. This is largely due to the fact that prices of scrap during the war have been held by action of OPA and WPB to very low levels as compared with those of the last war.

However, cost of operation of yard facilities has increased appreciably, and dealers have been unable to set aside any reserves such as were realized during that war. Many yards have been hard hit by the low income during the latter half of last year when scrap movement was slow because the steel mills, and the rest of the country as well, thought the war was over.

When they ceased buying at that time so as not to get caught with their burdening inventories, the yards had a pretty tough time and a few even had to close out their business or go into the more stable field of scrap brokerage. Meanwhile, those that remained in the business lost their personnel to higher-paying warplants so that after the time of the Belgian Bulge when the mills rushed into the market to fill their yards, there was little labor available for scrap preparation and transportation, and replacement of equipment was virtually impossible. Equipment broke down, and if it could not be repaired it had to be abandoned.

Alloy scrap has represented quite a problem during the war as mills have not been particularly eager to take it, except the high-nickel scrap of the SAE 2300 and 2500 compositions. Alloy scrap, under OPA ceilings, carries a premium not to exceed $1 per 0.25 pct nickel content. During much of the year the consumers were unwilling to pay the full premium for even the high-nickel types of scrap. Recently, however, when scrap supply became exceedingly acute the full premium for those grades was obtainable. However, mills are not paying any premium for the lean tri-alloy steels of the NE series. Mills would prefer not to take these steels but dealers have been able to make use of this scrap in the present tight market by blending it judiciously into carloads. Mills refuse to accept the higher alloy tri-alloy steels of the SAE 4300 series, since it is more difficult for them to control the composition ranges of their finished-steel products.

Army Ordnance is embarking on a program for the stockpiling of alloy steel scrap by ingotting for storage. In the present state of the market it would appear that this program might not get going for apparently the market could absorb almost any offering of scrap at ceiling prices or above. The trade points out that preliminary blueprints for this program do not provide for segregation by alloy and content and therefore the details may be difficult to work out if the market should drop to a position where stockpiling were necessary.

In view of the current shortage of ferrous scrap, it is conceivable that there might be some modification of the undisclosed program of battle scrap importation projected by committee members so as to increase the volume of returned ferrous material. This would be at the expense of many European nations which are in dire need of scrap to begin their reconstruction and rehabilitation programs. Moreover, the disorganized shipping situation would be likely to delay its return.

The pressure of the shortage of all grades of scrap in recent months has caused consumers and their suppliers to seek to circumvent the rigid control of ceiling prices. The first step in this direction however was taken, surprisingly enough, by OPA itself when it discontinued springboard limitation to $1 per ton. However, the agency was wise enough to foresee the possibility of a sellers' market by retaining ceilings in the latter half of 1944 when German collapse appeared imminent and the industry itself was in depair at depressed values.

The steel industry was not averse to seeing the collapse of scrap prices at that time because it was suffering the squeeze between rigid ceilings and the constantly accelerating pressure of inflationary costs. Industry members warned repeatedly at that time that the failure of consumers to continue ordering on an orderly basis would result in chaotic conditions in the preparation and handling of scrap, which would have an adverse effect if the market should need supplies again. There are those in the industry who attribute the shortage of scrap now to this period.

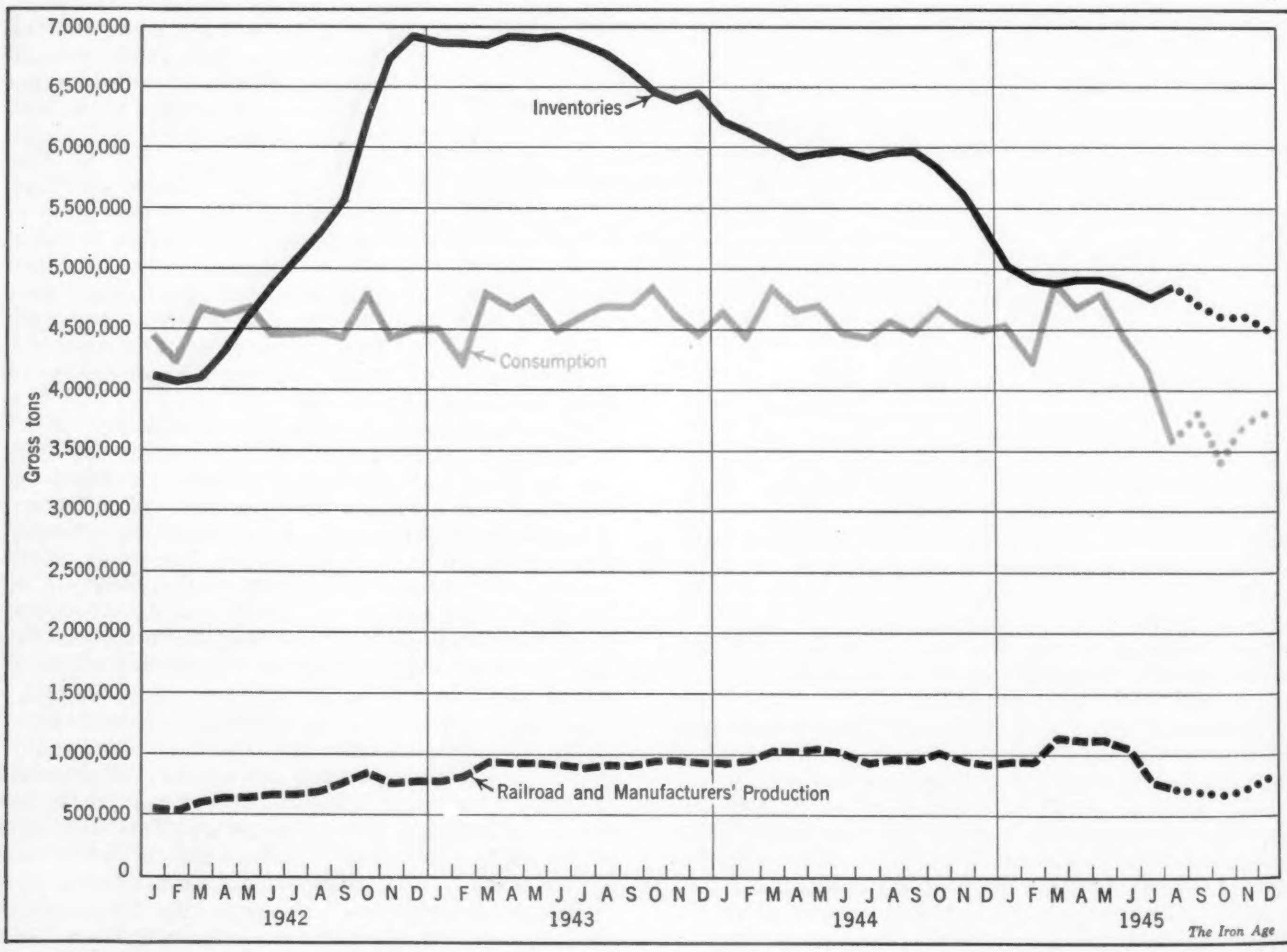
Now it is revealed that OPA is moving to check and control alleged violations of its scrap ceilings. How this development is likely to affect the movement to establish higher scrap maximum prices is hard to predict. It is conceivable that some consumers and dealers may go into action to urge price rises on the agency. On the other hand the impending steel strikes may free up supplies sufficiently to render this unnecessary.

The current gap between Coast scrap prices and ceilings is likely to be closed up somewhat in the near future because of the temporary reduction in freight rate to $12.32 for plate and structural scrap between the West Coast and Chicago. This will of course draw shipyard termination scrap to midwestern mills, and loading has already begun, the temporary rate to be effective on Dec. 22 for a period of four months. This action was fought vigorously by Coast mills who saw the move was sure to result in a higher cost for scrap locally. This development has already begun. Their opposition, however, restricted the cheaper rate to these products and left the lower grade scrap, available there in quantity, for their use.

The latest move in this West Coast tug-of-war has been the postponement of lowered freight rates on scrap for a six-month period, pending investigation by the Interstate Commerce Commission. At the end of this time it would appear that all Coast shipyard termination scrap should have been moved into local mills at relatively low cost, and midwest mills will not stand to gain by the new rate if approved.

In recent weeks, unprecedented snow and cold throughout the nation have compounded the problem of scrap supply which promises to be a factor of no mean significance to the steel industry in the months to come. While the impending steel strike is not by

SCRAP STATISTICS: Ferrous scrap inventories, consumption and production data during the war years as reported by the Bureau of Mines.



any means a bright spot in the reconversion picture, if it occurs as projected, it should serve to gain time for scrap movement to catch up with mill demand.

Recent reports, however, are that certain mills have deferred the placing of orders in anticipation of the strike. Nevertheless, this has not affected the firmness of the market, and there are indications that some orders are being placed for shipment several months later. There is some indication that if the strike gets under way, it may not be of long duration since even now CPA is conducting a study of the economic factors involved in the labor-management conflict and preliminary findings indicate that steel needed for civilian requirements in the postwar world must be continued in production even though it means increases in the ceiling prices of steel products required to compensate for wage increases.

In reporting on wartime scrap salvage activities, WPB estimated recently that its Salvage Div. had fostered the accumulation of approximately 6 million gross tons of scrap yearly since 1942 that would not otherwise be likely to have been obtained. The agency inaugurated its last scrap drive in February 1945 when inventories had declined by more than 1.2 million tons. The steel industry had requested this drive, which was confined to heavy melting grades. Activities of detinning plants during the war produced as a byproduct an average of about 150,000 tons of steel scrap annually since 1942.

Scrap has always been a barometer of business conditions generally, reacting to the economic cycle more quickly than any other statistical guide. This has been true during the war, even though prices of scrap hardly fluctuated from ceilings during the entire war. Now, however, we are entering a period when freer economic conditions will prevail. Businessmen may look to the scrap market again for guidance in anticipating the vagaries of the economic world.

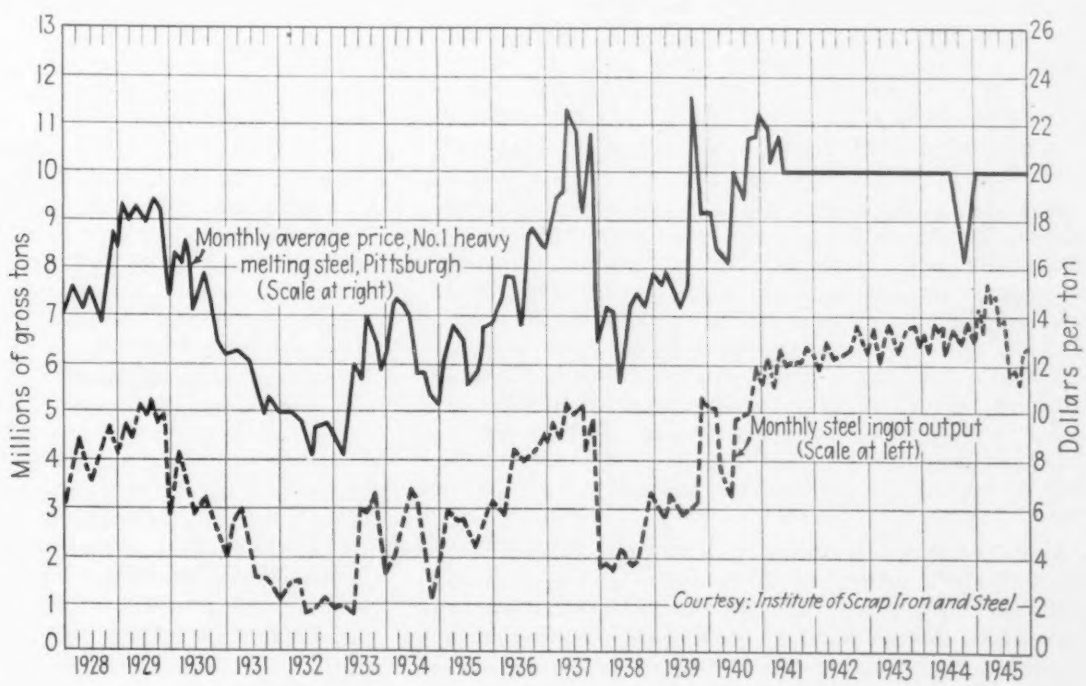
The Institute of Scrap Iron and Steel has prepared a chart showing the remarkable correlation between the steel ingot rate and scrap prices over a long period. Reproduced here, these curves are significant of the way in which scrap prices may be studied for subsequent fluctuations of the business cycle.

TABLE I

Inventories and Consumption of Scrap, and Production* by Railroads and Manufacturers
(000 Omitted)

Year and Month	Inventories On Last Day of Month, Gross Tons	Consumption, Gross Tons	Industrial Scrap Production, Gross Tons
1942 Total	61,902	54,062	7,978
1943 Total	80,893	55,088	10,886
1944 January	6,214	4,616	937
February	6,134	4,414	953
March	6,027	4,827	1,031
April	5,932	4,629	1,017
May	5,966	4,683	1,038
June	5,991	4,460	1,008
July	5,909	4,423	926
August	5,975	4,543	985
September	5,983	4,471	966
October	5,832	4,684	1,009
November	5,624	4,527	965
December	5,335	4,487	915
Total	70,922	54,764	12,750
1945 January	5,023	4,507	968
February	4,901	4,209	948
March	4,873	4,889	1,147
April	4,904	4,668	1,109
May	4,902	4,774	1,113
June	4,847	4,414	1,031
July	4,762	4,185	788
August	4,848	3,562	707
September **	4,700	3,800	695
October **	4,600	3,400	680
November **	4,600	3,700	708
December **	4,500	3,800	810
Total	57,460	49,908	10,704

* Bureau of Mines Data.
** Estimated.



SCRAP PRICES: Monthly average scrap prices for heavy melting steel at Pittsburgh vary directly with the ingot rate.

SECONDARY

tridge cases and shells, and other implements of mechanized war coming back from the battlefields. Actually all these supplies began to diminish last year as the actual amount of firing and fighting waned while V-Day was closing in, but the quantities are still, to put it gently, most substantial.

Smelters logically will be looking askance at the plans of the Navy to start up sloping-hearth reverberatory furnaces of 8,000 to 10,000 lb capacity at three coast points. In these will be melted down what is expected to be top-quality aluminum secondary, to be sold in 35-lb ingots at the floor price of 6¢ per lb, set by Surplus Property Administration Reg. No. 12.

BETTER things ahead are anticipated by the secondary metals industry. Operators who are not prone to whistle in the dark are predicting almost capacity operations for some time in the early Spring, and the facts of the situation make their viewpoint look logical. The intentions of the Navy to go into an extensive smelting program naturally cast some slight shadow on the industry's expectations, but the picture is good nevertheless.

A simple set of circumstances underlies the optimism expressed by well-posted operators. In the first place, steel, other prime metals and lumber are in scarce supply, causing producers of scores of different end-products to look at secondary materials and consider them as the answer to their needs. There are huge stockpiles of scrap piled up as the result of the war and the war's ending. In consequence, secondary metal will be seen in the months ahead in a multiplicity of adaptations all the way from lawnmowers to toilet seats.

The size of the scrap piles is, as always, a vague factor. The Navy, it became known a few weeks ago, alone has some 15,000,000 lb of the best quality secondary aluminum. Then on that basis the Army probably has nearer several hundred million pounds, perhaps more. Then the other service branches can contribute several million pounds. Beyond those supplies lie the ordinary day-by-day contributions of industry and other general sources. One guess is that a billion pounds of aluminum scrap, secondary and primary, are stockpiled through the country today.

Magnesium seems to be available in substantial, but unstated, amounts. Other important secondary metals—brass, lead, copper and the like—also are in very high, though hardly concentrated, supply as a result of the piles of used storage batteries, car-

It remains to be seen whether the Navy and its melting installations can get around the problems of impurities which have made some smelters shy away from aircraft scrap. Aircraft scrap, the industry has found, is notably contaminated with lead, iron, zinc and magnesium. The Navy figures its furnaces will be able largely to eliminate iron. But whether they will be able to cut down zinc content, which stands high on some aircraft aluminum sheet specifications, remains to be seen, and it also is a question at what point magnesium impurities will finally come to rest in the reclaimed ingot.

The operators themselves proclaim they cannot get very much out of junked aircraft if they expect to produce high-grade alloys. Airplane scrap yields some 92 pct of aluminum, they say, and the balance almost anything and everything. Probably it would be usable material, but consumers are in the habit of specifying on a high level, calling for carefully controlled material and definitely low impurities. For this reason much airplane scrap already briquetted and ready for smelting, much of it in usable alloy, is going begging.

Smelters do occasionally get obsolete material that is never going into airplanes now, like seats and gun turret castings where the alloy is segregated and there is no contamination of iron or brass, permitting easy smelting down to usable material. But they do look with no high regard on the 17S and 24S sheet which makes up so much of an aircraft, due to inherent tensile qualities and residual content.

In the light of these circumstances, there is one possibility that prices will go up during the period ahead. Aluminum borings and turnings have practi-

METALS

By W. A. LLOYD
Cleveland Regional News and Markets Editor

cally disappeared from the scrap market, and most of the secondary metals industry fed on the bushy grades during the war. If they have to buy solids instead of borings and turnings, prices might rise; and it might be mentioned that the yield from turnings is proportionately greater than from solids.

However, as long as the services continue to feed their supplies into the market, the possibility of a price rise cannot be considered imminent. Some thinking is that without the floor price of 6¢ per lb, there might be dumping of metal on the market at far lower prices.

Today the secondary metals industry is operating in very low ground. By the time the war had ended it was cut down to around 30 pct of its previous capacity, and it is operating today at no more than 35 pct or so of that straitened volume. But the turning of the corner seems near, and the fields beyond are green.

The future appears bright, what with the likelihood of widened use of secondary metals to replace hard-to-get steel, other primary metals, and lumber. War-born scrap piles are huge, and the Navy is going into business as a smelter itself to reduce the quantity of leftover aluminum, the success of which venture will depend on whether residues can be held below the limits necessary for the production of an acceptable, high-quality product.

Merchandising ingenuity is building new applications for secondary. Reynolds Metals, for instance, has developed a process of bonding thin sheets of aluminum to both sides of plywood sections, providing a rigid and strong material for construction, with excellent insulating characteristics. Scrap aluminum, rather than virgin ingot, will be used for this application.

A manufacturer of lawnmowers, seeking to eliminate the excess weight of these household instruments, will use secondary aluminum in place of iron —a field, incidentally, which the magnesium producers might investigate. At the far end of the scale from this adaptation is a toilet seat, made prosaic no longer by the use of aluminum instead of lumber. The metal seat costs probably triple the orthodox installation, but it's a luxury item the public is willing to buy, lumber is hard to get—so there you are.

Aluminum alloy castings, many of them employing secondary metal, are coming into wider play as sources for grey iron castings continue dried up. Calls have been registered at one company in recent weeks for aluminum castings, formerly made of iron, for use in pumps, air compressors, electric meters, engine manifolds, cylinder heads, brake shoes and transmission housings.

Of course the promised land for the secondary metals industry is Detroit and the auto plant network radiating out from it. This biggest big league of potential consumption is focused in the eye of the secondary smelters, and their hopes are high even though they have had no inquiries of consequence since the start of reconversion.

Despite this apparent lack of interest, some of them figure it is simply a matter of time—not too long time, either—before the auto companies turn to them. As proof they mention the continuing talk of lightweight automobiles, which, if it means anything, calls for considerably expanded use of aluminum and magnesium, much of it in applications which do not require virgin ingot. They point to the fact that the new Kaiser-Frazer cars, for which are claimed innovations to create new style and engineering trends, will be powered by engines using dominant quantities of aluminum. They read about the continued scarcities of one car component and then another, and they figure that what it all adds up to is that their turn will be coming, a turn which has the potential of putting them into the biggest business they have yet known.

WORLD

By JOHN ANTHONY
Associate Editor

AT last the veil of military security has been removed from wartime steel operations and for the first time since the war began it becomes possible to reveal the magnitude of the world's steel production facilities. United States production reached its peak in 1944 nearly 90 million ingot tons and 62 million tons of pig iron, which represented about half of peak world production of 184 million ingot tons and 135.5 million tons of pig iron reached in 1942 before the Russian loss of its Ukranian steel facilities.

Overall figures on U.S.S.R. production have not been made available; but it is known, based on the eyewitness account of competent authorities, that there exists in Russia today steel capacity which has never been reported to the world, secret 100 pct Russian-built plant duplicates of foreign-engineered and built Russian steel plants.

Germany

Authentic statistics on wartime steel production of Germany and its subjugated nations indicate that ingot production in the Reich increased to its peak in 1943 when nearly 34 million ingot tons were produced. About 20 pct of this total came from Austria, Alsace Lorraine, Luxemburg and Bohemia-Moravia (Czechoslovakia) which were added to the Reich after the war started. In addition, Poland, Belgium, France and the Netherlands which were not absorbed, supplied the German war machine with another 5 million ingot tons in 1943.

Wartime operating conditions caused a reduction in expected ingot capacity of about 20 pct, of which air raid alarms and air raid damage in the Northwest District represented a loss of German proper production of 7.5 pct in 1943 and 16.4 pct in 1944. Shortages of gas, power, raw materials, labor and other supplies in the Northwest District caused additional losses, compared to Germany proper production, of 6.2 pct in 1943 and 8.8 pct in 1944.

A special characteristic of the German steel industry is the concentration of production into a few districts. Organized in such a way that a large measure of dependence is placed on imported iron ore, the industry is largely localized on the principal coal deposits of Rhenish-Westphalia, the Saar and Upper Silesia. The country's industry is divided naturally into six districts of which the Northwest District, the former Rheinland-Westphalia and the Sieg, Lahn, Dillgebeit and Oberhessen Districts, is by far the most important, accounting in 1943 for 44.0 pct of Germany's ingot output and 38.3 pct of Greater Reich output.

PRODUCTION

War and occupation have eroded the steel capacities of the Axis triumvirate, but elsewhere in the world steel facilities have been built up to record levels. Yet many nations have plans afoot to convert, modernize and expand capacity still further to compete in normal postwar markets.

About 80 pct of Germany's total steel production came from nine large integrated trusts or combines of which Vereinigte Stahlwerke, A.G. with main offices at Dusseldorf, is by far the largest. Formed in 1926, this trust owns subsidiaries largely concentrated in the Ruhr which in recent times produced four times as much steel as the next largest combine, the Reichswerke Hermann Goering, A.G.

The Central District's steel production is mainly concentrated in a few large plants such as Mitteldeutsche Stahlwerke at Riesa and Brandenburg, the Ilsederhutte, A.G. at Peine, and the Reichswerke Herman Goering, A.G. at Salzgitter. The latter plant produced 825,600 ingot tons in 1943, 20.6 pct of the district total.

THE bulk of the pig iron produced in Germany was used for steelmaking. The Northwest District has long been the most important producer but its importance has been steadily diminishing since the beginning of the war. Prewar it accounted for about 70 pct of total output including that from the Saar. Due principally to increased capacity in other districts, the inclusion of production figures from Alsace Lorraine and Luxemburg and decreased production from the Northwest District, the latter's production decreased to about 48 pct since 1940, attributable in part to an increase in the use of scrap in the furnaces of the district.

German pig iron production showed an increase every year from 1938 through 1943 when allowance is made for the exclusion of Saar production from the statistics covering the period from September, 1939, to October, 1940. The total increase in the yearly output from 1938 to the peak year 1943 was approximately 6 million net tons. Most of this increase was due to the inclusion of production from areas outside of Germany in 1938. As a result of the conquest of Poland and the western democracies, additional production from those countries brought the total increase up to about 3.3 million net tons per year.

Because of the lack of good domestic ores, the German steel industry relies heavily on imported ores, principally from Sweden and France, for a large part of its iron requirements. The use of imported ores

World Ingot and Castings Production
(thousands of net tons)

	1945[1]	1944	1943	1942	1941	1940	1939
United States	80,100	89,642	88,836	86,032	82,839	66,983	52,799
Germany [2]	5,500	28,481	33,706	31,684	25,804	23,732	26,152
Poland	150	184	284	262	240	....	1,345
Belgium	550	622	1,862	1,578	1,835	2,520	3,200
France	1,280	1,407	2,662	2,429	1,658	6,160	9,260
Netherlands	60	100	177	176	210	....	....
U. S. S. R. (estimated)	20,000	15,500	14,000	30,000	31,000	31,500	32,000
United Kingdom	13,160	13,422	14,361	14,263	13,568	14,300	14,571
Japan (estimated)	5,000	15,000	13,000	8,700	7,000	6,350	6,230
Canada	2,868	3,024	2,995	3,121	2,701	2,255	1,326
Sweden	1,350	1,322	1,337	1,360	1,283	1,280	1,300
Spain	600	706	660	602	609	540	537
Brazil	200	218	202	175	171	155	145
All other countries [3]	3,065	3,274	3,322	3,458	3,423	3,388	3,250
	133,883	172,902	177,404	183,840	172,341	159,163	152,115

[1] Last few months estimated. [2] Includes Austria; from 1942 on, includes Alsace Lorraine, Luxemburg, Bohemia-Moravia and Bavaria. [3] India, Union of So. Africa, Italy, Australia account for a large part of the total.

was not appreciably curtailed during the war, although consumption by Ruhr mills of high phos dropped from 6.3 million tons in 1941 to 4.5 in 1944, and low phos from 10.2 million to 7.4. Germany experienced no significant shortages of nickel or manganese during the war.

Air raid damages to steel plants were predominantly to building roofs, overhead cranes, water, power, gas and air lines, and transportation facilities. Serious damage to blast furnaces, steel furnaces or rolling mills were found infrequently. About 20 pct of steelmaking capacity could have resumed operations within one month after repair parts and utilities were made available, another 40 pct after four months and the balance within nine months.

U.S.S.R.

THE Soviet eastern steel industry is based on tremendous coal reserves with veins hundreds of miles wide, but a basic economic and military weakness lies in the fact that there is a lack of appropriate ore reserves in the Urals or Siberia. If Russian press and technical journal reports are to be believed, geologists report after years of investigation "absence of information on large deposits of rich ore in the Far East must be ascribed to an inadequate method of survey rather than to their absence in that district."

The Kuznetsk Metallurgical Combine at Stalinsk, western Siberia, is part of the Urals-Kuzbass combine based on the Kuznetsk coal basin in Siberia and the Magnitogorsk iron ore of the Urals. These are reputed to be two of the largest Soviet steel plants and designed for a shuttle train service carrying mutually needed ore and coal. Subsequent development of both areas has led to greater independence, but this basic interdependence remains. Publicized Siberian ore sources are approaching exhaustion, or are low grade and contain zinc, the removal of which is an unsolved problem. Moreover, the expanded Magnitogorsk capacity has lessened the possibility of ore deliveries to Kuznetsk and caused the abandonment of the plan to build a second plant there before the war. Meanwhile in order to keep Kuznetsk operating, railroad shipments of coal and ore must shuttle back and forth a distance of 1452 miles each way.

Since the total volume of ore hauled annually between principal metallurgical regions reached 6 million tons prewar, and Kuznetsk received only 2.2 million tons, considerable tonnages of ore must be shipped all the way from the Ukraine Krivoi Rog basin to the Urals. Blast furnaces in the Far East use low grade ore from Nikolayevski and Kimbansk.

U.S.S.R. steel production on the basis of daily production figures published in 1939 in Pravda and Izvestia was indicated to be 28 to 29 million metric tons. In the opinion of informed on-the-spot observers, steel production was actually about 32 million metric tons. The difference is caused by the production of certain steel plants operating under the Commissariat of Defense and not under any civilian commissariat. Production of Commissariat of Defense plants was never included in published production figures.

One of these plants is located at Izhorsk about 15 miles east of Leningrad on the line to Vologda. Others are believed to exist in Siberia, one probably being in the vicinity of Novosibirsk.

Russian steel production has been largely openhearth (95 pct). It is estimated that total electric-furnace production in 1939 was 2 million tons. The estimated loss of 50 pct of capacity during the height of the German occupation of the Ukraine is believed to have left Russia with only 12 to 14 million tons of capacity in the East, including many small furnaces that had been out of operation. Kuznetsk and Magnitogorsk are each believed to have contributed 3.5 million tons toward this production.

It is more than likely that much of the destruction to Ukranian steel plant and the flooding of mines was first caused by the Russian scorched earth policy and followed later by additional German destruction after Stalingrad. Russian comment on German destruction to the steel industry of the Ukraine admits that the Germans never operated any of these captured facilities.

United Kingdom

British steel production during the war was handicapped by the necessity for conserving on import tonnage of iron ore and scrap, the former being reduced to less than 2 million tons annually in 1942 and 1943 as compared with a prewar average of 5.6 million tons. Scrap dropped to only 4500 tons in 1943. United Kingdom lower grade home ores greatly reduced blast-furnace production and the supply of hot metal available for steelmaking. Nevertheless, deliveries of steel products to home consumers increased from a prewar average of 10 million tons to an average of 14.7 million tons during the war, largely by means of increased imports from the United States and a drastic reduction in exports. The Corby Works of Stewarts and Lloyds was specially designed to use low grade ores and might conceivably hold its own under conditions of postwar free enterprise but other plants would find it impossible to operate profitably unless subsidized or protected by tariffs. Therefore it is reasonable to assume that the British steel industry may revert to the use of the richer foreign ores.

Britain's proposed 5-yr plan for re-equipping and modernizing its steel industry calls for an ingot production of 16 million tons. It includes additional coke oven capacity of 2.5 million tons, 19 new blast furnaces, $80 million worth of new steel plant, replacement and reconstruction of rolling mills and new continuous hot strip mills in South Wales to the tune of $130 million, and auxiliary and finishing plant costing $65 to $75 million.

Construction has already started on 100,000 tons of openhearth capacity in the Midlands for special tube steel. Four blast furnaces are already being rebuilt and coke ovens in Scotland and on the Northeast Coast are being replaced. A new plant has been started at Darlington for structural sections and extensions to heavy steel works are now under way.

France

In France, the Germans managed the steel industry during their occupation solely for the immediate needs of their war machine. Their zoning system, which favored the Moselle plants, took no account of the normal channels of supply or sales and left the other plants only about 100,000 tons of coke a month, for example. There was absolutely no provision for maintenance of equipment so that a large part of it is all but useless now. Coke ovens, for example, were required to be continually stopping and restarting because of the lack of a regular supply of coal and must now be rebuilt.

Even now the fuel supply is not good, although since February the position has improved somewhat. Allocations for March, April and May average 160,000 tons, but this may be compared with prewar consumption averaging 550,000 tons of coke and 185,000 tons of coal monthly. In the second half of the year fuel

World Pig Iron[3] Production
(thousands of net tons)

	1945[1]	1944	1943	1942	1941	1940	1939
United States	53,200	62,073	61,895	60,115	56,070	46,979	35,396
Germany [2]	4,400	20,990	26,718	24,506	23,561	17,136	20,363
Poland	65	76	118	106	85	......	......
Belgium	650	623	1,802	1,386	1,569	2,494	3,444
France	848	1,214	2,345	1,746	1,443	5,192	8,625
Netherlands	60	72	100	165	196	......	......
U. S. S. R. (estimated)	19,000	17,000	15,000	25,000	24,000	22,000	20,000
United Kingdom	7,840	7,421	7,919	8,300	8,145	9,042	8,794
Japan (estimated)	2,100	7,500	10,500	6,000	4,000	2,950	3,250
Canada [4]	1,793	1,852	1,758	1,975	1,528	1,309	846
Sweden	950	903	872	813	787	672	700
Spain	540	680	659	638	595	550	548
Brazil	280	320	273	236	229	205	165
All other countries [5]	4,150	4,595	4,320	4,586	4,224	3,727	3,510
	95,876	125,319	134,279	135,572	126,432	112,256	105,641

[1] Last few months estimated. [2] Includes Austria; from 1941 on, includes Bohemia-Moravia. [3] Includes charcoal iron and ferroalloys made in blast furnaces. [4] Does not include ferroalloys. [5] India, Australia and Union of So. Africa account for a large part of the total.

quotas were readjusted somewhat in favor of the iron and steel industry. The French based their hopes on the use of German coal but those hopes have been dashed. Although given the Saar, its production will amount to no more than 20,000 tons per month and even all this production will not go to France for German coal is being pooled. The rich Ruhr coal deposits are held by Britain but it is understood that this coal is earmarked for German heating and industrial fuel.

Transportation is another serious handicap to the French steel industry. During March the industry had available only 300 railway cars a week whereas for even the current low operating rate some 2000 are needed.

Much equipment including electrical motors and rolling mills were requisitioned by the Germans and until recently at least the French have not been able to arrange for its return.

Belgium

The Belgian steel industry is in much the same position as France's, suffering from lack of fuel, inadequate transportation, electric power shortages and ruined plant equipment. With a prewar maximum of 47 blast furnaces operating and a wartime peak of 32, it was estimated early this year that there were only two operating normally. However, in September the first cargo of Swedish ore was on its way, and 13 blast furnaces and 8 openhearths were in commission. Monthly production of steel during 1945 has varied between 45,000 and 80,000 tons.

Japan

Production for the last quarter of 1945 has been set by the Allies at 121,000 tons of pig iron and 155,000 tons of steel for the Japanese Iron & Steel Control Assn. A recent Japanese news agency report has stated that bombardment had crippled the Japanese steel industry to the point where output had been reduced to 250,000 tons in the first quarter of 1945.

Spain

The production of iron and steel in Spain depends on available supplies of ore which are constantly decreasing. The low production of the Biscay iron and steel industry is not due to lack of capacity which has been expanded appreciably in recent years and is said to provide for 600,000 tons of pig iron and 750,000 tons of steel annually.

India

There are at present six openhearth steel producers and eight electric furnace operators. Recent production statistics have not been made available.

Czechoslovakia

The Skoda plants were badly damaged by bombing during the war but are already engaged in making motor cars and Czechoslovakia may be one of the first European countries to be restored to normal production.

South America

The new government-owned Volta Redonda steel mill near Rio de Janeiro has not yet come into production although all plant facilities are reported to have been completed and the mill is said to be stockpiling raw materials preparatory to going into production. The mill will include a coke battery of 55 ovens, 4 blast furnaces and complete rolling mill capacity. The plant is designed to take advantage of the rich Brazilian iron ore deposits.

In Chile, the Corporacion de Fomento de la Produccion, a government instrument designed to advance industrial development of the country especially with respect to utilization of hydroelectric power, has arranged for a credit of $28 million from the Export-Import Bank for the establishment of an integrated steel plant at Concepcion. Plans for the mill contemplate a production of over 100,000 tons of finished products annually, to include reinforcing steel, light structural shapes, thin plates and shapes, strip for welded pipe, and drawn wire. Electric furnaces using cheap hydroelectric power will get the high-grade iron ore from the El Tofo region in northern Chile. Electricity will be used for smelting the ore since Chilean coal is not suitable for metallurgical purposes.

FOREIGN

By
JACK R. HIGHT
European Editor

PENDING the formulation of a detailed plan for the future of continental Europe among the world powers, each of the states involved is straining in its traces, trying to work out its own salvation whether there is to be any for its neighbors or not. True, some countries are making a greater effort than others, while some have been more favored by the ill-fortunes of war, and consequently have fewer problems to solve. The most urgent delaying factor in the solution of individual problems remains the determination of a workable policy for the future of Germany, and until such a policy is laid down all reconstruction efforts are destined to be of a temporary and superficial nature.

At the end of 1945 the country that was the industrial keystone of European economy was partitioned into four zones, laid out on lines of military convenience. In control of one of these zones is a country that is filled with a consciousness of its own precarious position, and a dread of any reborn Germany that after three tragic experiences has become an understandable mania. Another section is controlled by a country torn within itself over the question of the propriety of an agrarian Germany incapable of feeding its population vs. a rebuilt industrial Germany that might repeat its past transgressions. Still another occupying power is waking with blinking eyes to the knowledge of its international responsibilities, and is still making up its mind just how much it wants to do about Europe's problems. The last power is the only one which has done its utmost to carry out as quickly as possible what it sees as best for its own segment of Germany (the creation of a buffer territory which will consist of a Great Central European Desert).

Possibly the most important corollary to all this confusion is the fact that the interdependence of the western European countries before the war was so great that until a policy is laid down for the future of industrial Germany, none of the industrial countries nearby can make any definite plans for the rebuilding of their shattered economies. France cannot know whether she will get Ruhr coal or be able to sell ore; Sweden does not know if she can sell her iron ore; Belgium and Luxembourg must face the coal procurement problem; Great Britain cannot determine whether her eager industrialists will be able to capture Germany's markets.

This indeterminate state exists although a special meeting was held in the past summer for the precise purpose of laying down the basic principles from

RECONSTRUCTION

A nearly paralyzed European economy appears doomed to get worse before it gets better, and getting better hinges in part on liberal doses of American credit. And, if the agrarian concept of Germany undergoes no modification, the standard of living of all the neighboring nations will only with great trials and tribulations rise above marginal war levels.

which such answers could be drawn. The product of this meeting was the Potsdam Declaration, under which Germany has been governed for the past six months. With the lack of news reporting from the Russian-Polish occupation zone, it is difficult to determine just how accurately the precepts of the Declaration are being carried out in eastern Germany, but the general opinion among Western Powers is that if the Potsdam agreement condones what is happening there, then it was a major international blunder. Although the basic concept of the agreement was to reduce Germany to the status of an agrarian state, with her steel ingot production reduced greatly, Britain for her part has many officials supporting a rebuilt Ruhr capable of producing 10 or 11 million tons of steel ingot per year. American opinion vacillates between this figure and the two or three millions specified by Stalin, with most Americans concerned favoring about 8 or 9 million tons. Thus Britain is facing a conclusion that would completely upset the Potsdam concept, and President Truman is said to be convinced that it needs important revisions.

The part of the Potsdam conference that makes the result even more unfortunate was that France was not present, and feels little responsibility therefore in the administration of her zone of occupation. Thus with no major power well satisfied with the agreement at the moment, the urgency of a more permanent and applicable instrument becomes evident, but seems almost unattainable at the present time.

President Truman's reluctance to hold further "Big Three" meetings precludes additional policy making on that level, and the next step, the Council of Foreign Ministers, has already two strikes against its record. The United Nations Organization must of necessity go through a difficult establishment period before it is to be ready to operate in this economic and industrial sphere, and so seems ill-suited to present needs.

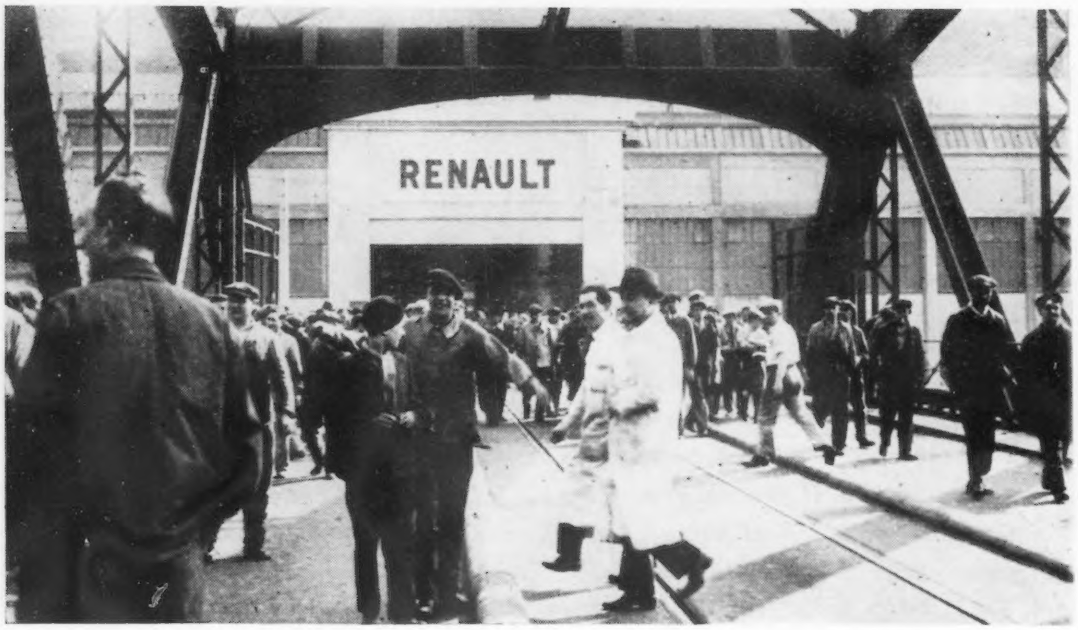
When the situation in Germany becomes sufficiently acute that action is tragically necessary, the victorious powers can either carry out the agrarian future planned for Germany in the original agreement (and begin to determine how her peoples are to be fed, and how the rest of Europe is to maintain its standard of living without her manufactured goods), or modify the agreement in favor of some German industry. If the agrarian concept is not modified, due to economic interdependence, the other nations of the Continent are certain to have their standards of living held down to reduce the levels that they have reached during the war, and the smoldering resentment of de-industrialized Germany will merit the constant attention of the United Nations in the future. Or, in the other case, if a compromise of the agrarian concept is concluded, France must be satisfied that her position is secure despite some Ruhr steel production, and it may become possible for Germany to pay for some food imports with coal, steel, or manufactured goods.

European Economy in Chaos

It is difficult for a person to realize without actually witnessing the situation just how completely disrupted the European economy was at the end of the war, and how nearly paralyzed it still was at the end of the year. With due respect to the improbabilities of immediate action as outlined above, it seems likely that the situation will get even worse before it gets much better, particularly in the case of Germany.

The British military government occupying the Ruhr industrial area has endeavored to get some slight steel production under way in order to furnish materials for the repair of transport equipment, but the tonnages are small. The French government is objecting seriously to even the small production that is going on, and there is every likelihood that the plants that are in some production today are grinding themselves to a halt, since there is no appreciable inflow of raw materials. Thus, although production may be estimated for the last months of 1945 at nearly 5 pct of capacity, even this level is to be diminished when stockpiles of raw materials on hand at mills and in rail cars are exhausted.

In the evolution of a policy which will stave off as much as possible of actual starvation and acute human suffering among the peoples of Europe this winter, as well as getting a basic economy operating once more, the coal problem is and has been the crux. With Belgium and France working desperately to produce



SMASHED in an RAF air attack, the Renault plant in suburban Paris is fully rebuilt for peacetime automobile production. Currently it is one of the pawns in the shift of France to state ownership of basic industries.

as much as possible from their domestic mines, the operation of the Ruhr mines, under the direction of a special British mission becomes the final hurdle. With Ruhr exports in sufficient quantities both France and Belgium will navigate the winter with a minimum of suffering, and will not have to stop the industrial production which has gotten under way. But the process of getting the totally inadequate coal supplies of today from the Ruhr is a typical example of the task facing the rebuilding of anything at all in Germany.

The mines themselves were found to be fundamentally undamaged, and the reopening has been largely a labor problem. The Nazis had been using a large proportion of foreign labor in the pits, most of it impressed. The liberation of these peoples and their departure for home closed up this labor supply. Former German miners were found to be disclaiming their previous occupation as they were rounded up, and professing to be agricultural workers.

When miners did become available they were found to be unable to perform any reasonable amount of work since their ration amounted to only 1000 calories per day. Below the generally accepted starvation level, this ration effectively prevented physical work of any nature. An extra ration system was set up for the benefit of the miners, but it did not improve output since the men were loath to eat the extra food while their wives and families were starving. Thus, canteens had to be set up, giving men extra food on the provision that it be consumed in the canteen.

When the food question was well on its way to solution it was discovered that a large cause of absenteeism in the pits was a fear of leaving wives and daughters at home unprotected while hordes of displaced persons were roaming about the countryside; so the d.p. problem had to be taken in hand. Men in the mines are still taking two or three days off per week to go out into the countryside to forage for potatoes and other food that they may be able to locate.

The basic problem remaining for the coal districts is the location of some incentive for the miners to get maximum production. Such incentive does not exist; the only possible encouragement that the man gets is that he does get a slight coal allowance for his home. Money is no incentive, as there are no consumer goods of any description to be bought in the Germany of today. In addition, the miners are well aware that the fruit of their efforts is going to France, Belgium, and Holland, and so they are not actually output minded. Aside from the permission for the miners to pick up some coal and take it home, there is no other allowance for domestic users in Germany except in extreme hardship cases.

The canals and rivers of Germany have only been cleared within the past few weeks, and some craft are available for transport on them. The railroad situation remains acute, and it seems evident that until an adequate substitute for the railroads is set in operation, it will be impossible to feed Germany. At the present there is in certain northern dairying areas an excess of some food supplies, but no means of transport is available to move it. Ports are only beginning to function, and will be able to handle only a trickle of supplies until major repairs can be undertaken at some time in the future.

Of a 16 million-ton prewar capacity of steel ingot in the Ruhr, there is approximately 11 million tons potential today in either undamaged or slightly damaged state. There is about four million tons capacity in about the same condition in other parts of the British zone, out of a wartime peak production for all of Germany and satellites of about 37 million tons. Included in the 11 million figure are facilities that will need new equipment to fill production gaps, as well as a supply of ore.

German Ores Exhausted

As is the case with many of the world's steel production centers, the high grade ores of Germany are exhausted, and before the war Germany was importing up to 10 million tons of high grade ore from Sweden to make up this deficit. Today no ore is flowing from Sweden—no transport is available to ship it, even if there were a way for Germany to pay. This difficulty in obtaining high-grade ore for the Ruhr without an adequate means of payment, in juxta-

position with the presence of the Goering steel works built to operate on low-grade German ores might rationally legislate against the Ruhr in favor of the new central German mills.

Despite this possibility of operating the Goering works without need for foreign exchange, they are at present on the "available for reparations" list, and it seems probable that at least part of the valuable sintering machinery formerly located at the Salzgitter plant is already on its way to Britain, if not already there. (Britain, too, has exhausted its high-grade ores.)

The ultimate destiny of the steel capacity of the Ruhr still depends on the policies to be determined by the United Nations. At present there are as many proposals as there are interested powers. France has expressed herself in favor of international control, and some American officials have been known to lean in this direction. In general, however, there is a cynicism of such arrangements growing out of the memory of the ill fortune which befell such projects after World War I. Barring such a plan, the French Government does not seem to be willing to see steel made in Germany. Cynics on the opposite side of the question assert that France's ability to produce all the food that she needs puts her in a position where she is relatively independent of Germany's prosperity.

Among the British officials who are controlling the Ruhr today there is considerable difference of opinion as to the proper course for the future. Some authorities maintain that the insurance of an agrarian economy for Germany will be the only way of protecting the future of peace. Siding with such opinions are those who feel that such a state will be the only method whereby Britain can expand her exports sufficiently to maintain prosperity. It is pointed out that part of the reason that the German food problem is so serious today is that during the thirties the munitions program was considered so urgent that much rich agricultural soil was allowed to stand idle while the farm labor went into industry. The difficulty with such an argument is that of quantitative evaluation.

German Production Imperative

Other British opinion comes out strongly in favor of a gradual return to the 10 or 11 million tons steel production theoretically possible with modest repairs. Some officers feel that this is a problem which eventually Canada and America will have to face, as they are the only two nations in a position to make the long-term financial assistance available to Germany for getting the mills in operation. Some official opinion in London goes so far as to say that if such aid is not forthcoming, the standard of living of all western Europe will be only slightly higher than that in the European desert which Stalin is creating in the east. The standard of living will certainly drop very low in the Germany of 1946. No decision will be needed to get it down. Only if we decide to raise it will action be required.

To make as near an approach to industrial reality as possible it may be desirable to set down the requirements to get the Ruhr in production. To imagine the hypothetical and doubtful situation in which all of the major powers come to the conclusion that it would be wise to get 10 million tons of steel out of the Ruhr annually, these things would be required:

(1) An Allied credit. Assuming that this would not be in the form of any kind of grant, it would have to be a very long-term loan.

(2) Food supplies. Use of part of the funds to buy food, presumably from the western world, to keep the people alive until the benefits of the rebuilding could be appreciated.

(3) Purchase of a limited amount of machinery, to fill the gaps in damaged production sequences. (It might be possible to hold this to a very slight minimum by extending the period of reconstruction and allowing Germany to pay for machinery in steel ingot export, or semifinished products.)

(4) Purchase of high-grade ore in sufficient quantities to support production.

Outside the boundaries of Germany itself, the European nations are working individually to bring about

(CONTINUED ON PAGE 288)

FAILURE to rationalize Ruhr coal production continues to depress the entire western-European economy. Here a couple of German youngsters pick up their weekly coal ration to supplement that which their fathers get for digging the coal.

EXPORT

THE foreign trade convention conducted by the National Foreign Trade Council as a meeting of exporters and manufacturers engaged in export from all over the United States drew more delegates this past year than in any of the previous 31 years.

There was only one complaint heard during the three days of the meeting—the problem of getting the goods to fill export orders. By a show of hands at one of the sessions, of the delegates in attendance at the time more than one half reported trouble in receiving allocations from their sources of supply. About twenty reported that they were receiving sufficient allotments for export from their own companies as against over 150 that said they were not receiving a sufficient supply. However, at the same time they admitted that the same companies are not satisfying their domestic demands either. The answer is that there is difficulty in filling export orders because manufacturers are just unable to supply the goods, not because American industry is neglecting export or is not export-minded.

At the convention, the following question was presented to the delegates: "Taking everything else into consideration, how many export managers feel that the export end of their business is being handled on an equal basis with domestic trade?"

The overwhelming majority of the export managers in the audience raised their hand in answer to this question. Only twelve or fifteen indicated that they felt their own company was not giving export a fair deal.

A big majority of the attending export managers reported that the front office is now better inclined toward export than before the war. Hardly any said the attitude is now worse.

The limited supplies that are obtained for export are mostly being shipped to old accounts, the importers trying to make new connections are still finding it tough sledding.

During the war years, the United States maintained a large volume of commercial exports in addition to heavy lend-lease shipments. The exports *other than lend-lease,* showed only a small falling off from the year 1939, which meant that U. S. industry in addition to supplying enormous volumes of goods through lend-lease, continued to supply friendly nations of the world with the goods customarily purchased from this country. The foreign trade figures for the years 1939 through 1944 and for the first 8 months of 1945 are shown in the table above.

It is interesting to note that during the first 8 months of 1945, the actual value of "cash" exports was 26 pct greater than in the comparable period of 1944. This means that the tapering off of lend-lease was reflected in increased normal trade.

UNITED STATES EXPORTS (000 omitted)

Year	Total	Lend-Lease	Pct	"Cash"	Pct
1939	$3,177,000	$	....	$3,177,000	100.0
1940	4,021,000	....	....	4,021,000	100.0
1941	5,147,000	741,000	14.4	4,406,000	85.6
1942	8,079,000	4,932,000	61.0	3,147,000	39.1
1943	12,963,000	10,357,000	79.9	2,606,000	20.1
1944	14,261,000	11,305,000	79.3	2,956,000	20.7
1945 (8 mos.)	7,451,000	5,007,000	67.2	2,444,000	32.8

The total shipments abroad from this country reached an unprecedented peak of over $14 billion in 1944. Never before in the country's history had there been any such volume of goods sent to other countries. The previous peak was in 1920 when $8 billion were shipped. Normally, the value of the nation's exports averages $3 to $4 billion a year.

The $14 billion in 1944 was roughly 80 pct lend-lease, 20 pct "cash," but does not include supplies shipped to U. S. forces overseas.

The Lend-Lease Record

Lend-lease is now ended. The figures show that by far the greater part of the lend-lease shipments were war supplies and food that have been consumed and expended. Actually only a relatively small percentage represented goods that would normally have been exported on a commercial basis and a relatively small percentage remains in usable condition to compete with commercial exports in the future.

Under lend-lease, this country shipped altogether during the war over $38 billion of goods. Although this in value represents some ten years of normal trade, actually the effect on future American export trade is expected to be very slight.

Lend-lease was stopped after the defeat of Japan. Even before that the volume of lend-lease shipments started to decline. Since August, 1945, only such

Foreign trade reached record levels during the war under the impetus of lend-lease, and prospects are bright for continued good trade abroad, what with American industry more export minded than ever before in its history. However, growing industrialization throughout the world will be reflected in definite changes in character of American exports.

By ROBERT H. JOHNSTON
Publisher, *American Exporter,* New York

shipments as represented winding up of orders in process were made.

From the start of lend-lease, in March 1941 up to July 1945, the following (below) was shipped.

Of the total aid, $8,658,000,000 worth, or almost 21 pct of all lend-lease, consisted of non-combat military supplies, such as signal, engineer and communication equipment and medical supplies, and industrial materials and equipment. Of this, approximately three billion dollars represented various types of military equipment and supplies furnished to the armed forces of allies. Industrial and transportation machinery, equipment, tools and supplies amounted to about three and a half billion dollars.

TOTAL LEND-LEASE AID

March 1941 to July 1, 1945

Category	Amount	Pct of Aid
Goods transferred:		
Munitions (including ships)	$20,691,562,000	49.2
Petroleum products	2,184,730,000	5.2
Industrial materials and products*	8,657,714,000	20.6
Agricultural products	5,906,466,000	14.1
Total transfers	$37,440,472,000	89.1
Shipping and other services	4,580,307,000	10.9
Total .end-lease aid	$42,020,779,000	100.0

* Includes signal, chemical warfare and engineer equipment; medical supplies; chemicals, machinery, metals and minerals; and other military and war production equipment and supplies.

About a billion dollars worth of iron and steel had been lend-leased and nearly a billion dollars worth of other metals and minerals.

From the beginning of lend-lease through the end of June, 1945, 42 pct of all lend-lease goods exported went to the United Kingdom. The U.S.S.R. ranked second with 28 pct of total shipments.

The following table shows a comparison between the lend-lease shipments and normal commercial trade. The figures show how much in all was shipped under lend-lease during the war to the principal countries and how much these same countries bought in a comparable period immediately before the war.

Countries	Total Lend-Lease Exports, March 1941 to July 1945	Total Exports from the U. S. A., 1935 to 1938
United Kingdom	$13,498,000,000	$1,931,000,000
U. S. S. R.	9,128,000,000	170,000,000
Africa, Middle East and Mediterranean	3,334,000,000	587,000,000
China and India	2,231,000,000	394,000,000
Australia and New Zealand	1,378,000,000	341,000,000
Canada	618,000,000	1,685,000,000
Latin America	243,000,000	2,029,000,000

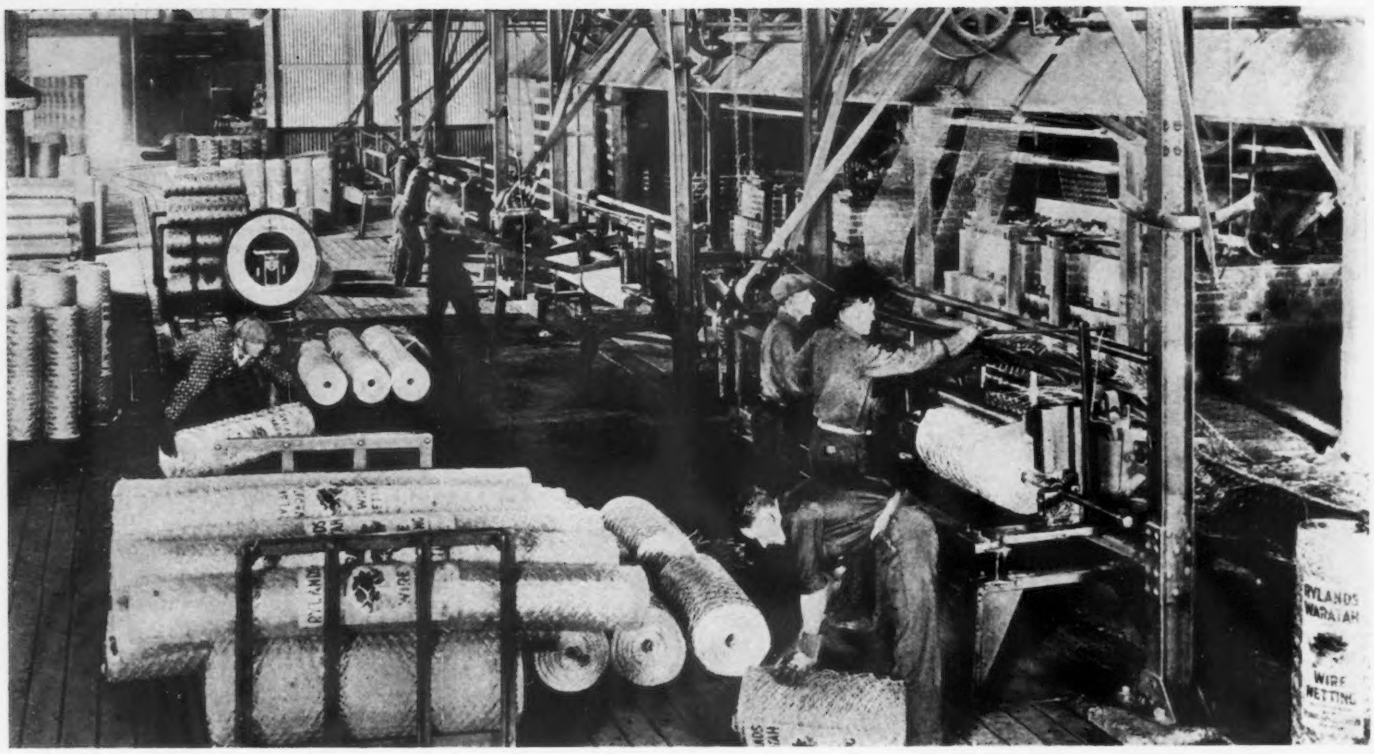
This shows that the military shipments went to the countries actively engaged in the war and had relatively little relation with normal trade. For Latin American countries, lend-lease represented only a small part of their normal trade.

Loyal to Export

In the face of great demand right here at home, almost all exporting manufacturers during the war years never lost sight of the long-term advantage of an export business and remained loyal to export. Commercial shipments held up remarkably well in view of the heart-breaking delays and difficulties of government red tape, export licenses, shipping permits and all the rest on top of the manufacturing problem.

Despite this record, there are some who claim American business is losing a great opportunity in export by not catering to foreign business during the reconversion period. These critics do not seem to pay any attention to the fact that domestic orders are also turned down at the same time as export orders and that most manufacturers are taking care of both on a fair, proportionate basis.

The established importer abroad fully realizes that he has to wait his turn and that there is little danger of this country ever forgetting or neglecting export while so many businessmen, acting as exporters or export managers, depend on foreign trade for their livelihood. They are fighting for their share of production and getting it. American industry is



AN example of the secondary manufacturing industries being established in countries all over the world whose economy formerly depended on agriculture, mining and primary production. This is the wire weaving plant of Rylands Ltd., Australia, manufacturer of poultry wire.

right now selling to export customers at the rate of $3,984,000,000 of goods a year, which is more than in the prewar years. In 1937, the figure was $3,349,000,000.

There are also officials in the government that feel that if the U. S. government did something to stimulate American industry to go after export, sales abroad would be greatly increased. Those in the export field cannot understand how this is figured out. The export business is full of aggressive and wide-awake men who are not neglecting any visible opportunity of making a sale. In fact, the desire for American products abroad is so great that almost every country in the world has restraints imposed on her own people to prevent them from buying more American products than can be paid for.

Controls Maintained Abroad

Henry Wallace, Secretary of Commerce, in an address to the recent foreign trade convention, said: "Although we in the United States are making progress in the relaxation of controls, I am concerned over the fact that there appears to be little prospect of any immediate general relaxation of controls throughout the world. I do not think that any of us are so naive or unrealistic as to believe that we shall see a return to 'laissez-faire' in foreign trade. That is a fact to which we must adjust our minds, and is a situation that calls for a new role on the part of the U. S. Government in connection with foreign trade. A major part of this new role will no doubt be related to the establishment of the international economic organizations which I have spoken of and which we hope will lead to the substitution of rational discussion and mutual agreement for unilateral action and outright economic warfare."

He recommended: "We must give concrete evidence of our willingness to reduce our barriers to trade and thus promote our own best interest as well as that of other nations. Unless we are successful in this endeavor, we may find ourselves engaged in a costly trade war, with the Russian group, the sterling group, and the dollar group, divided against each other. Under such conditions, world trade will shrink, the general welfare will be adversely affected, and the peace of the world still be jeopardized."

In the opinion of the delegates attending the convention, the present exchange and import restrictions in Latin America and other parts of the world are in force solely for the purpose of making sure that the imports into these countries were limited to essential goods. Each country wants to use its foreign exchange resources to obtain those products that will benefit the national economy. Actually the exporters of machinery and industrial equipment, which are classed as essential goods, feel the system benefited them as there was a greater assuredness of receiving payments for their own exports under the system and they unanimously reported that the import permit system presented no difficulties to them in exporting essential goods.

The fact that the U. S. governmental export controls are being dropped does not mean that international trade is returning to anything like a free basis. World trade is subject to far more controls now than before the war. Practically every important trading nation has a variety of controls on imports and exchange.

In the case of Latin American countries, imports are controlled on the basis either of import permits or exchange permits which the individual countries issue for the purchases they feel are most essential to their national well-being.

In Great Britain, imports from the U. S. since the end of the war have been on a cash purchase basis and firms in Great Britain have not been granted permits for purchases from this country for any products that the British Government feels are not necessary or are obtainable in England or other Em-

pire countries. This situation is the result of a lack of American dollar funds in England and any change will depend on the loan from this country.

Here (at right) is a list of the present controls in principal foreign countries affecting U. S. exports.

There is little evidence of any intention on the part of the foreign governments to discontinue these controls in spite of the fact that they are contrary to the letter and spirit of the Reciprocal Trade Agreements. However, the understanding is that in the British sterling areas importers will be given greater freedom to purchase from American manufacturers as a result of our loan to England.

	Import Permit Required	Exchange Controlled
Argentina	no	yes
Australia	no	yes
Belgium	yes	yes
Bolivia	yes	yes
Brazil	certain items	yes
Canada	no	yes
Chile	no	yes
Colombia	yes	yes
Cuba	no	no
Denmark	no	yes
Ecuador	yes	yes
Egypt	yes	yes
Eire	no	yes
France	yes	yes
Mexico	no	no
Netherlands	no	yes
India	yes	yes
Iran	no	yes
Iraq	no	yes
New Zealand	no	yes
Palestine	yes	yes
Peru	no	yes
Portugal	no	no
Spain	no	yes
Sweden	no	yes
Switzerland	yes	no
Turkey	yes	yes
United Kingdom	certain items	yes
Union of South Africa	no	yes
Uruguay	certain items	yes
Venezuela	no	yes

Of the countries in this list, only in the case of Cuba, Mexico and Portugal can importers purchase from U. S. manufacturers without obtaining in advance a license or exchange permit.

Reciprocal Trade Agreements

Next to the ending of lend-lease and the dropping of most export controls, the most important event in export trade in 1945 was the renewal of the Hull Reciprocal Trade Agreements program for a period of another three years.

The program of reciprocal trade agreements was started in 1934 and during the next 11 years, agreements were signed with 28 foreign countries. These agreements reduced in each case some barriers against our goods and prevented present barriers from being raised or new ones imposed. In exchange our own tariffs on foreign goods of a non-competitive nature were reduced, and on the basis of our "most favored nation" treatment, the concessions in each separate agreement were extended to all friendly nations.

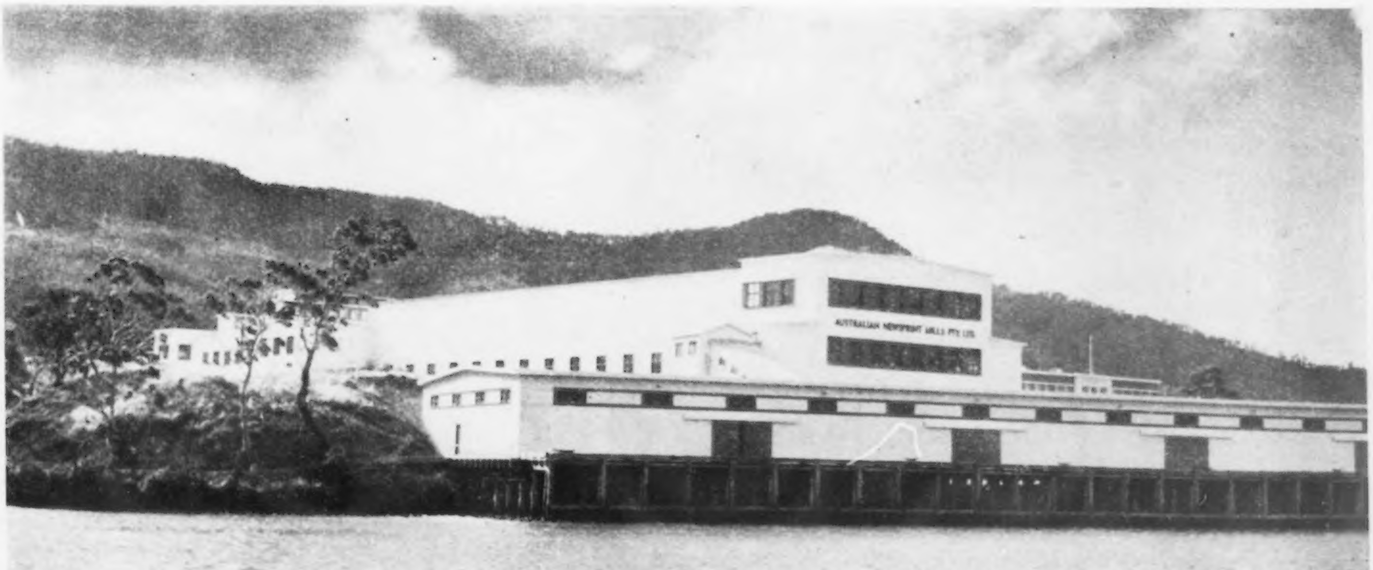
This year there was much congressional debate and nation-wide interest on the question of continuing the legislation. The debate centered on a proposal to allow the Secretary of State to reduce our tariff rates, in negotiating future agreements, by as much as 50 pct of the rates in effect in 1945. Previously the limit was 50 pct of the rates in effect in 1934. As finally passed, rates could be reduced up to 50 pct of the 1945 figure, which gives our State Department something real to bargain within exacting concessions from other governments. In many cases, the rates had already been reduced the full 50 pct of the 1934 figure.

The bill was passed with support from both political parties. In the House the vote was 250 for and 164 against. Of those voting for renewal, 34 were Republicans and 216 Democrats. In the Senate, 61 voted for and 28 against. Republicans voting for renewal accounted for 15 of the affirmative votes, Democrats 46.

At the recent convention, mentioned earlier, the statement was repeatedly made by many of the speakers, as it is made regularly whenever foreign trade is discussed, that "we must import in order to export; we must buy in order to sell." Although this idea is universally accepted and received with approbation by almost every audience, very little has actually been done in this country to increase our imports from abroad.

In recent years, the only practical means found

Typical of the rapid industrialization in most countries of the world is this new newsprint mill near Hobart, Tasmania.



for lowering our own and other nations' tariff barriers has been by Reciprocal Trade Agreements. Actually the effect on our own imports has not been great—nothing like what the enemies of the program feared or the friends hoped. But it has been the only step in the desired direction and exporters were heartened at the congressional action in passing the renewal.

Now that the legislation is renewed it is time for new action. James A. Farley, who is now head of Coca-Cola Export, in his address at the opening session of the convention, said: "There has been a good deal of silence in official quarters about trade agreements since the revised Act was passed by Congress last June. I suggest that it is time for the announcement of trade-agreement negotiations with several important countries. We ought to do our best to demonstrate that the United States means business in this matter and that when we talk about the reduction of trade barriers and the removal of discriminations all around the trading circle, we mean exactly that."

Export Controls Dropped

The controls on U. S. exports by our own government have been largely lifted and are no longer a subject of concern to foreign traders. The remaining controls are looked upon as temporary. At one time officials in Washington felt it necessary to continue rigid export controls generally to prevent export shipments from taking such a large share of critical items as to retard reconversion here. That idea has been discarded. It is obvious that industry itself would never give too large a proportion of output to export.

Exporters are free in most industries, as far as the U. S. government is concerned, to sell their products where and as they please.

For shipments to Axis countries and a few other markets, notably Argentina and Spain, individual licenses continue to be necessary. All other countries come under "general license." The term "general license" is misleading, as shipments to countries in this classification, as a practical matter, require no license at all.

The principal line of finished products still on the list of restricted exports is builders' hardware. All export orders for builders' hardware and the few other products still have to clear through the Department of Commerce's Office of International Trade Relations, the successor to FEA. Individual licenses for such products continue to be necessary regardless of destination.

Used truck are on the restricted list, but new trucks are not. Other finished products still subject to strict export control include leather goods, cotton goods, woolen worsteds, lumber, plywood, newsprint paper and some rubber manufactures such as gloves and boots.

Aside from finished manufactures, foods in short supply still are subject to control. So also are soaps and certain nonferrous metals in primary and semimanufactured form.

Reasons for the remaining controls are based principally on shortages in this country or fear that acute shortages might develop if all restrictions were removed. Resumption of normal financial transactions with all countries of the world except European neutrals and former enemy nations was announced early in December by Fred M. Vinson, U. S. Secretary of the Treasury.

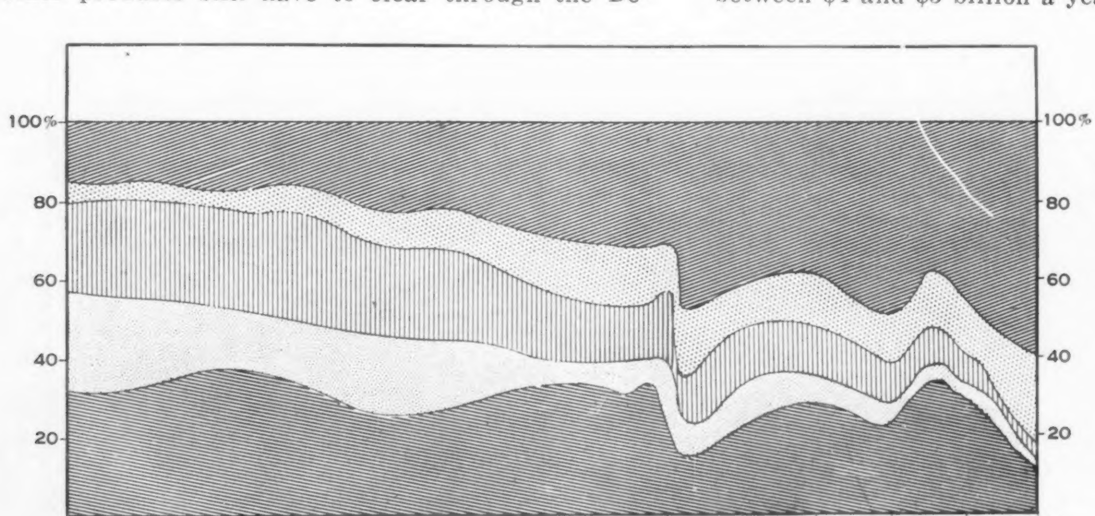
Mr. Vinson pointed out that the Treasury's action "permits the immediate resumption of normal financial and commercial relations. United States banking facilities may be used to finance all transactions between the licensed countries and between these countries and any non-bloc countries. Financial instruments and documents, currency and securities and instructions relating to property interests may be sent to the licensed countries."

Regarded as significant is the continuance of the Treasury's foreign fund controls with respect to current transactions of Spain, Portugal, Sweden, Switzerland, Lichtenstein and Tangier, the former neutrals. As a result, they are put in a disadvantageous position with regard to resumption of normal foreign trade, since their transactions will still be subjected to Treasury supervision.

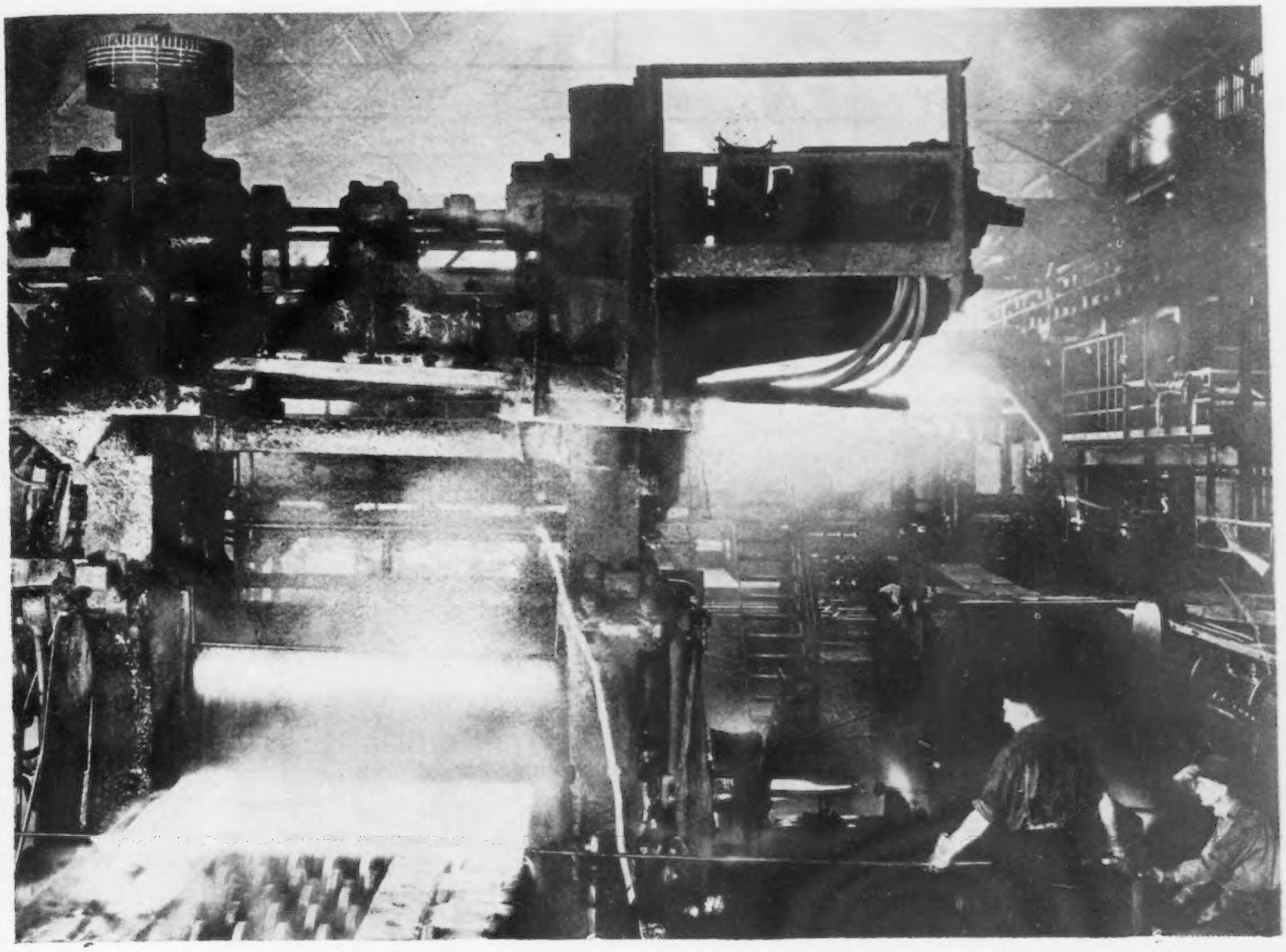
Price controls on exports are automatically dropped whenever the control on the same product sold in this country is discontinued.

What We Export

Shipments of goods from this country grew from an average of less than two billion dollars before World War I to $8 billion in the record year of 1920. From 1921 to 1929, the exports averaged in value between $4 and $5 billion a year. This dropped to a



PERCENTAGE of United States exports by economic classes, 1875 to 1940. This shows the growing proportion of exports of manufactured products and the relative decrease in the importance of food products as an export item.



STEEL rolling mill in operation in the plant of the Broken Hill Proprietary, Ltd., Newcastle, Australia. In 1939, Australia produced over a million tons of steel.

little over a billion and a half in 1932 and 1933 and then increased steadily to over $5 billion in 1941.

It is interesting to note, in addition to a general increase in total foreign trade, there has been over the years a great change in what goods we have exported. The chart accompanying this article shows the nature of this change. Before the first World War this country shipped principally raw materials and foodstuffs. In the last 30 yr manufactured goods have become an increasingly important part of export trade. Not only has the volume of manufactured goods in general sold abroad increased over the years but also the sale of industrial machinery has become increasingly important. In 1920, industrial machinery accounted for 10 pct of the manufactured goods exported, in 1940 this grew to 18 pct.

Industrialization Abroad

Countries all over the world are now manufacturing products formerly imported. In Australia, India, South Africa, Argentina, Brazil, Mexico and other lands there have sprung up hundreds of secondary industries.

This trend shows every sign of continuing and becoming more pronounced. The result as far as U. S. is concerned there will be fewer sales of the simpler manufactured consumer products in countries where these products are being made, but total export trade will expand and more machinery, technical and engineering supplies and other highly specialized manufactures will be shipped.

The trend to this can already be seen in the figures. American industrial machinery and supply exports should be far greater in the future than in the past.

Some idea of the industrialization occurring abroad is given by the following examples:

The industrial output in the city of Sao Paulo, Brazil, doubled in the period from 1935 to 1940.

The new steel mill in Brazil at Volta Redonda will produce almost twice as much steel as produced in all of Brazil previously each year and will take care of half of Brazil's steel requirements.

Industrial production in Chile is now 80 pct greater than in 1929.

Argentina in 1930 imported half of her requirements in cement and produced locally the other half. By 1940, only 0.1 pct of her cement requirements were imported, the rest produced locally.

The British Empire Restrictions

For many months there has been a rising tide of criticism by American exporters, and by importers in certain British markets and in the Middle East, against the use of import controls which appear to discriminate against American goods and in favor of British goods.

The countries of the sterling block have agreed to pool their available dollar exchange. Each country in this block receives only a limited amount of dol-

(CONTINUED ON PAGE 292)

PRICES

By JOHN ANTHONY and H. W. VAN CAMP

These cost and production histories are the variables on which accurately to appraise postwar plans. Included are monthly and yearly price and production averages for all the raw materials and finished products of interest to producers and consumers of ferrous and nonferrous metals.

(Jan. 3, 1946)

AND PRODUCTION

THE IRON AGE Price and Production Summary

Steel Ingot Production

Openhearth, Bessemer and Electric Ingots and Steel for Castings—Net Tons

For data previous to 1920, see statistical supplement, THE IRON AGE, Jan. 4, 1940

Source: American Iron and Steel Institute

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
January	3,974,213	2,832,150	2,129,686	4,325,457	4,107,080	4,719,919	4,656,029	4,302,172	4,531,172	5,115,195	4,288,212	2,852,540	1,685,665
February	3,836,328	2,248,923	2,332,217	3,909,643	4,305,501	4,223,613	4,264,863	4,327,341	4,590,842	4,920,348	4,579,761	2,892,154	1,681,421
March	4,417,344	2,019,465	3,168,503	4,579,489	4,733,607	4,721,111	5,035,081	5,148,330	5,117,384	5,760,878	4,828,571	3,468,208	1,627,030
April	3,532,623	1,560,522	3,267,086	4,463,564	3,767,877	4,033,752	4,626,271	4,685,249	4,888,226	5,626,610	4,664,182	3,141,887	1,429,848
May	3,860,482	1,627,229	3,623,434	4,748,038	2,970,710	3,888,883	4,425,910	4,594,340	4,776,766	6,008,754	4,520,520	2,897,385	1,277,302
June	3,991,068	1,289,861	3,520,973	4,242,308	2,324,411	3,606,900	4,207,512	3,968,129	4,250,736	5,573,076	3,879,960	2,416,078	1,036,102
July	3,752,903	1,032,726	3,324,009	3,976,776	2,112,991	3,471,854	4,095,783	3,637,255	4,320,783	5,513,546	3,316,654	2,143,351	915,738
August	4,017,502	1,462,971	2,959,784	4,161,827	2,872,652	3,850,644	4,492,374	3,971,467	4,744,291	5,614,144	3,473,898	1,949,462	961,153
September	4,016,322	1,510,108	3,172,549	3,780,066	3,181,798	3,927,822	4,409,463	3,710,754	4,709,416	5,146,744	3.223,766	1,754,817	1,125,892
October	4,038,323	2,078,382	3,838,975	4,028,163	3,516,891	4,377,214	4,591,053	3,764,573	5,279,460	5,154,063	3,055,972	1,805,653	1,233,957
November	3,533,112	2,133,903	3,861,539	3,529,560	3,512,087	4,393,068	4,175,502	3,549,711	4,844,460	4,002,365	2,510,820	1,807,315	1,171,710
December	3,133,690	1,834,504	3,715,317	3,224,324	4,016,316	4,469,629	3,906,230	3,604,731	4,562,175	3,299,786	2,246,742	1,477,529	977,389
Total	46,103,910	21,630,744	38,914,072	48,969,215	41,421,921	49,684,409	52,886,071	49,264,052	56,615,711	61,735,509	44,589,058	28,606,379	15,123,207
	1933	**1934**	**1935**	**1936**	**1937**	**1938**	**1939**	**1940**	**1941**	**1942**	**1943**	**1944**	**1945**
January	1,157,745	2,276,596	3,279,411	3,474,353	5,398,326	1,984,815	3,663,004	5,764,723	6,928,085	7,112,106	7,424,522	7,592,603	7,206,223
February	1,221,664	2,521,472	3,169,849	3,379,587	5,050,824	1,942,795	3,448,120	4,525,797	6,237,900	6,512,535	6,824,604	7,194,009	6,654,589
March	1,022,675	3,190,040	3,273,848	3,810,436	5,970,247	2,293,884	3,929,387	4,389,183	7,131,641	7,392,111	7,674,578	7,826,257	7,707,965
April	1,531,813	3,346,922	3,017,120	4,494,782	5,801,540	2,196,413	3,431,600	4,100,474	6,756,949	7,121,291	7,373,703	7,593,688	7,291,826
May	2,250,236	3,875,202	3,009,189	4,614,529	5,894,260	2,061,169	3,372,636	4,967,782	7,053,238	7,382,578	7,549,691	7,702,576	7,451,752
June	2,919,687	3,487,612	2,580,723	4,543,888	4,787,710	1,868,848	3,606,729	5,657,443	6,800,730	7,015,302	7,039,353	7,234,257	6,842,290
July	3,607,288	1,697,879	2,591,191	4,473,940	5,212,832	2,259,677	3,648,639	5,724,625	6,821,682	7,144,958	7,407,876	7,498,387	6,987,008
August	3,260,279	1,574,649	3,331,707	4,782,442	5,580,683	2,903,805	4,341,726	6,186,383	7,000,957	7,227,655	7,586,464	7,498,913	5,736,376
September	2,599,370	1,446,551	3,227,815	4,744,841	4,907,592	3,029,736	4,881,601	6,056,246	6,819,706	7,057,519	7,514,339	7,235,111	5,983,361
October	2,373,729	1,689,272	3,590,878	5,182,430	3,881,819	3,554,912	6,223,126	6,644,542	7,242,683	7,579,514	7,814,117	7,620,885	5,597,782
November	1,731,930	1,836,008	3,599,619	4,941,014	2,464,793	4,072,676	6,292,322	6,469,107	6,969,987	7,179,812	7,371,975	7,278,719	6,246,758
December	2,047,780	2,239,125	3,511,636	5,056,843	1,685,273	3,583,253	5,958,893	6,495,357	7,163,999	7,304,540	7,255,144	7,366,170	*6,400,000
Total	25,724,196	29,181,329	38,182,986	53,449,085	56,635,899	31,751,983	52,797,783	66,981,662	82,927,557	86,029,921	88,836,366	89,641,575	80,106,031

* Estimate.

Finished Steel Composite Price

(cents per pound)

Source: THE IRON AGE

• • • **Weighted average of** THE IRON AGE quotations on following steel items: Hot-rolled and cold-rolled strip, bars, plates, shapes, hot-rolled and cold-rolled sheets, wire, rails and pipe. The composite was revised in 1941 to obtain greater sensitivity in reflecting price changes. This revision was described in detail in issue of Aug. 28, 1941, p. 92. Prior to 1941, this index was computed on the basis of finished steel shipments in the 10-yr period 1929-39. The three years, 1941, 1942 and 1943, are based on annual shipments for the year. Since 1944, the index has been based on quarterly shipments. Averages on the old basis for previous years were published in the annual statistical supplement, Jan. 4, 1940.

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945
January	1.83017	1.95757	2.06492	2.07642	2.32263	2.58414	2.35367	2.30467	2.30467	2.28249	2.29176	2.27235	2.38444
February	1.81151	1.95757	2.06492	2.06513	2.32263	2.58084	2.35367	2.30467	2.30467	2.28249	2.29176	2.27235	2.38444
March	1.80821	1.95757	2.06492	2.05463	2.53185	2.57754	2.35367	2.30467	2.30467	2.28249	2.29176	2.27235	2.38444
April	1.77951	2.00659	2.06492	2.06220	2.58414	2.57754	2.35367	2.26015	2.30467	2.28249	2.29176	2.30329	2.42471
May	1.76994	2.15367	2.06492	2.06220	2.58414	2.56939	2.30807	2.30467	2.30467	2.28249	2.29176	2.30329	2.42471
June	1.78578	2.15367	2.06492	2.06680	2.58414	2.51300	2.28297	2.30467	2.30467	2.28249	2.29176	2.30329	2.42471
July	1.84089	2.10667	2.06492	2.13890	2.58414	2.35944	2.28297	2.30467	2.30467	2.28249	2.29176	2.30837	2.44076
August	1.85084	2.06492	2.06492	2.13890	2.58414	2.35944	2.28297	2.30467	2.30467	2.28249	2.29176	2.30837	2.44076
September	1.87877	2.06492	2.06492	2.14554	2.58414	2.35655	2.28297	2.30467	2.30467	2.28249	2.29176	2.30837	2.44076
October	1.95473	2.06492	2.07642	2.17210	2.58414	2.31964	2.28297	2.30467	2.30467	2.28249	2.29176	2.21188	2.44076*
November	1.94737	2.06492	2.07642	2.17210	2.58414	2.35367	2.28837	2.30467	2.30467	2.28249	2.29176	2.21188	2.44076*
December	1.95757	2.06492	2.07642	2.26276	2.58414	2.35367	2.30467	2.30467	2.30467	2.28249	2.29176	2.21188	2.44076*
Average	1.85127	2.05149	2.06779	2.11814	2.53620	2.45874	2.31088	2.30096	2.30467	2.28249	2.29176	2.27298	2.42287

* Estimate.

United States Pig Iron Production

Includes ferroalloys made in blast furnaces, but excluding charcoal iron
(thousands of net tons)

Source: 1901 *to* 1942, THE IRON AGE, *October* 1942 *to* 1945, *A.I.S.I.*

	Jan.	Feb.	Mar.	April	May	June	First Half	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1901	1301	1270	1433	1408	1500	1476	8,388	1523	1496	1456	1548	1526	1418	8,967	17,355
1902	1599	1409	1618	1652	1728	1621	9,627	1615	1644	1589	1659	1605	1722	9,834	19,461
1903	1649	1558	1668	1801	1920	1874	10,470	1732	1760	1741	1596	1163	949	8,941	19,411
1904	1035	1353	1625	1748	1721	1452	8,934	1256	1314	1521	1630	1664	1810	9,195	18,129
1905	1996	1789	2168	2153	2200	2007	12,313	1951	2065	2127	2299	2256	2292	12,990	25,303
1906	2317	2133	2425	2323	2349	2214	13,761	2255	2158	2208	2461	2450	2503	14,035	27,796
1907	2471	2290	2493	2485	2571	2503	14,813	2527	2520	2446	2506	2047	1382	13,428	28,241
1908	1171	1207	1375	1288	1306	1223	7,570	1364	1523	1589	1756	1767	1950	9,949	17,519
1909	2014	1912	2056	1948	2109	2162	12,201	2355	2519	2671	2912	2853	2952	16,262	28,463
1910	2922	2685	2932	2782	2677	2537	16,535	2407	2360	2303	2344	2139	1991	13,544	30,079
1911	1971	2011	2433	2314	2121	2004	12,854	2008	2158	2214	2355	2240	2288	13,263	26,117
1912	2305	2352	2694	2660	2815	2734	15,560	2700	2813	2760	3013	2947	3116	17,349	32,909
1913	3130	2896	3096	3083	3161	2945	18,311	2867	2852	2807	2852	2501	2222	16,101	34,412
1914	2111	2115	2630	2542	2344	2148	13,890	2193	2234	2109	1992	1700	1698	11,926	25,816
1915	1793	1887	2312	2370	2535	2667	13,564	2871	3114	3195	3501	3401	3587	19,669	33,233
1916	3567	3458	3740	3614	3764	3596	21,739	3611	3589	3586	3930	3710	3559	21,985	43,724
1917	3529	2963	3642	3735	3827	3662	21,358	3743	3638	3510	3699	3591	3229	21,410	42,768
1918	2701	2596	3599	3683	3861	3723	20,163	3832	3796	3828	3904	3757	3846	22,963	43,126
1919	3699	3293	3461	2775	2361	2369	17,958	2721	3072	2787	2087	2679	2949	16,295	34,253
1920	3377	3337	3781	3068	3344	3409	20,316	3435	3525	3504	3688	3287	3029	20,468	40,784
1921	2705	2169	1788	1336	1368	1193	10,559	969	1069	1104	1396	1585	1847	7,970	18,529
1922	1842	1826	2280	2321	2583	2644	13,496	2694	2034	2278	2956	3191	3457	16,610	30,106
1923	3617	3353	3947	3976	4332	4117	23,342	4119	3864	3501	3527	3241	3272	21,524	44,866
1924	3382	3441	3883	3622	2929	2269	19,526	1999	2114	2299	2774	2811	3318	15,315	34,841
1925	3774	3600	3992	3650	3283	2995	21,294	2984	3030	3052	3386	3386	3640	19,478	40,772
1926	3714	3274	3855	3864	3900	3623	22,230	3610	3586	3512	3734	3626	3461	21,529	43,759
1927	3477	3294	3901	3832	3798	3461	21,763	3305	3300	3108	3118	2966	3020	18,817	40,580
1928	3214	3248	3585	3567	3678	3452	20,744	3441	3514	3429	3779	3698	3774	21,635	42,379
1929	3855	3591	4160	4102	4366	4163	24,237	4239	4218	3918	4019	3563	3177	23,133	47,360
1930	3166	3180	3636	3564	3620	3286	20,452	2956	2827	2550	2425	2092	1866	14,716	35,168
1931	1920	1912	2276	2261	2233	1836	12,438	1639	1435	1309	1314	1235	1098	8,030	20,468
1932	1089	1080	1084	954	877	704	5,788	640	582	663	721	707	612	3,925	9,713
1933	637	621	607	699	993	1417	4,974	2007	2053	1705	1519	1215	1323	9,822	14,796
1934	1361	1416	1813	1934	2288	2162	10,974	1372	1181	1006	1065	1072	1151	6,847	17,821
1935	1654	1802	1983	1863	1934	1739	10,975	1702	1972	1990	2215	2315	2360	12,554	23,529
1936	2269	2042	2285	2693	2966	2896	15,151	2905	3037	3058	3351	3301	3489	19,141	34,292
1937	3597	3359	3875	3799	3961	3481	22,072	3919	4039	3819	3239	2248	1669	18,933	41,005
1938	1601	1454	1627	1541	1406	1189	8,818	1346	1673	1882	2298	2543	2476	12,218	21,036
1939	2436	2307	2682	2303	1924	2373	14,025	2639	2979	3224	4063	4167	4220	21,292	35,317
1940	4032	3311	3270	3137	3514	3819	21,083	4054	4238	4177	4446	4403	4548	25,866	46,949
1941	4664	4198	4704	4334	4600	4553	27,053	4771	4791	4717	4856	4703	5012	28,850	55,903
1942	4971	4500	5055	4896	5073	4935	29,430	5051	5009	4937	5237	4966	5201	30,552	59,982
1943	5137	4766	5314	5035	5178	4836	30,343	5023	5316	5226	5324	5096	5213	31,434	61,777
1944	5283	5091	5442	5251	5351	5064	31,482	5157	5210	4988	5200	4904	4998	30,457	61,939
1945	4945	4563	5228	4786	5016	4605	29,142	4801	4249	4227	3388	4026	*3910	*24,601	*53,744

*Estimate

(CONTINUED ON PAGE 224)

Spiegeleisen, 19 to 21 Pct

(carloads, per gross ton, at furnace)

	1929	1931	1932	1933	1934	1935
January	$31.00	$28.00	$26.00	$24.00	$27.00	$26.00
February	31.00	28.00	26.00	24.00	27.00	26.00
March	31.00	28.00	26.00	24.00	26.50	26.00
April	31.00	28.00	26.00	24.00	26.00	26.00
May	31.00	28.00	26.00	24.00	24.00	26.00
June	31.00	28.00	25.75	24.00	26.00	26.00
July	31.00	28.00	25.00	27.00	26.00	26.00
August	31.00	28.00	25.00	27.00	26.00	26.00
September	31.00	28.00	25.00	27.00	26.00	26.00
October	31.00	28.00	25.00	27.00	26.00	26.00
November	31.00	28.00	24.40	27.00	26.00	26.00
December	31.00	26.20	24.00	27.00	26.00	26.00
Average	31.00	27.85	25.35	25.50	26.21	26.00

	1936	1937	1938	1939	1940	1945
January	$26.00	$26.00	$33.00	$28.00	$32.00	1944
February	26.00	26.00	33.00	28.00	32.00	1943
March	26.00	28.40	33.00	28.00	32.00	1942
April	26.00	30.00	33.00	28.00	32.00	1941
May	26.00	32.25	33.00	28.00	32.00	price
June	26.00	33.00	33.00	28.00	34.40	fixed
July	26.00	33.00	28.00	28.00	36.00	at
August	26.00	33.00	28.00	28.00	36.00	$36.00
September	26.00	33.00	28.00	31.00	36.00	
October	26.00	33.00	28.00	32.00	36.00	
November	26.00	33.00	28.00	32.00	36.00	
December	26.00	33.00	28.00	32.00	36.00	
Average	26.00	31.14	30.50	29.25	34.20	

Cast Iron Pipe at New York,

(net ton, 6-in. and larger)

	1929	1930	1931	1932	1933	1934
January	$39.60	$36.10	$37.90	$30.20	$35.20	$43.00
February	39.35	38.60	37.90	29.70	35.30	43.00
March	38.60	38.75	37.90	28.40	35.30	43.00
April	37.40	39.50	35.40	28.20	35.30	43.00
May	35.85	39.90	34.15	28.20	35.30	43.00
June	35.10	39.90	33.70	28.20	38.30	44.00
July	33.20	39.30	32.90	28.73	38.30	45.00
August	33.60	38.90	32.90	31.10	38.30	45.00
September	33.60	38.90	32.90	31.30	38.30	45.00
October	34.60	38.90	32.90	33.30	38.00	45.00
November	34.60	38.65	32.90	33.30	43.00	45.00
December	34.60	37.90	32.50	34.30	43.00	45.00
Average	35.84	38.78	34.50	30.41	37.81	44.08

	1935	1936	1937	1938	1939	1945
January	$45.00	$45.20	$48.00	$53.00	$49.00	1944
February	45.00	45.20	48.00	53.00	49.00	1943
March	45.00	45.20	51.00	53.00	49.00	1942
April	45.00	45.20	53.00	53.00	49.00	1941
May	45.00	45.20	53.00	53.00	49.00	1940
June	45.15	45.20	53.00	52.20	49.00	price
July	45.20	45.90	53.00	49.00	49.00	fixed
August	45.20	45.90	53.00	49.00	49.00	at
September	45.20	45.90	53.00	49.00	49.00	$52.20
October	45.20	45.90	53.00	49.00	52.20	
November	45.20	45.90	53.00	49.00	52.20	
December	45.20	47.90	53.00	49.00	52.20	
Average	45.11	45.71	52.00	50.93	49.80	

Scrap Composite Price

Average of THE IRON AGE *quotations on No. 1 heavy melting scrap at Pittsburgh, Chicago and Philadelphia—gross ton.*

	1933	1934	1935	1936	1937	1938
January	$6.77	$11.73	$12.29	$13.47	$18.33	$14.00
February	6.83	12.25	11.98	14.12	19.27	13.86
March	6.96	12.82	11.06	14.75	21.25	13.46
April	7.73	12.54	10.46	14.59	21.02	12.40
May	9.70	11.57	10.70	13.39	18.54	11.54
June	9.97	10.67	10.74	12.81	17.28	11.32
July	11.27	10.53	10.96	13.29	18.79	13.29
August	12.08	10.15	12.25	15.04	20.43	14.51
September	11.35	9.63	12.71	16.45	18.73	14.34
October	10.56	9.54	12.67	16.63	15.89	14.21
November	9.94	10.04	12.90	16.31	13.34	14.74
December	10.50	11.43	13.33	17.10	13.46	14.88
Average	9.47	11.07	11.85	14.83	18.03	13.54

	1939	1940	1941	1943	1944	1945
January	$14.94	$17.58	$20.88	1942	$19.17	$19.17
February	15.01	16.88	20.08	price	19.17	19.17
March	15.20	16.56	20.29	fixed	19.17	19.17
April	14.77	16.14	19.22	at	19.17	19.17
May	14.17	17.60	19.17	$19.17	19.17	19.05
June	14.71	19.31	19.17		19.17	19.00
July	14.92	18.47	19.17		19.17	19.17
August	15.43	18.72	19.17		19.10	19.17
September	18.32	19.91	19.17		17.87	19.17
October	21.48	20.63	19.17		15.87	19.17
November	19.66	20.83	19.17		16.54	19.17
December	18.05	21.42	19.17		19.04	19.17
Average	16.39	18.67	19.49		18.55	19.15

Assembly Line . . .

STANLEY H. BRAMS

• Appraising 1945 and looking to 1946 finds the auto manufacturers beginning in low gear and cherishing hopes that labor peace will make 1946 a banner year . . . Kaiser-Frazer shows its new design and makes West Coast plans.

DETROIT — The automobile industry moves into 1946 limping very badly. Even though hopes are high for record production during this year, production problems developed out of the labor situation are starting the cycle off in very low gear, and the immediate future—as well as the medium term future—is definitely uncertain.

The sizable block of production ordinarily credited to General Motors Corp. was lacking as the turn was made into 1946, because of the strike of the CIO United Automobile Workers Union. Packard was closed down because of parts shortages, and its prospects of obtaining bodies from Briggs Mfg. Co. were dimmed by the strike of glass workers. Nash, too, is at a standstill because of the glass situation. Willys and Studebaker, closed during the latter part of 1945 because of the recently-ended strike at Warner Gear Co., Muncie, Ind., have resumed operations, but on none too stable a basis as long as strikes continue. Ford assemblies are slow because of scattered parts difficulties, and Lincoln and Mercury are in the same boat.

Thus far, according to the Automobile Manufacturers Assn., no more than 75,000 models of 1946 series have been built by all manufacturers.

The AMA, quoting from a survey of schedules of the Civilian Production Administration, reports that the coming year should see 570,000 workers employed in automotive manufacturing by next June, turning out approximately $570 million in automotive products.

As against the slow start being made by the auto industry is a lavish picture of demand. George Romney, general manager of AMA, pointed out that the new car and truck markets have been multiplied by deterioration and other factors. Whereas 29,507,113 passenger cars and buses were registered in 1941, he noted, only 25,350,000 were registered in 1945. And of these many are definitely overage, as is indicated by the fact that the 1945 figure is only about 220,000 lower than the total for 1944.

REGISTRATION of motor trucks increased slightly in 1945 over 1944 but was lower than the 1941 figure. In 1945, 4,650,000 trucks were registered compared to 4,513,340 in 1944 and 4,876,054 in 1941. Of the 630,000 motor trucks manufactured this year, 315,000 went to the civilian market, the remaining 355,000 going to the armed forces. In addition 16,500 buses were produced, closely approaching the 1941 figure of 16,596 and almost double the 1944 total of 9462.

Total motor user taxes have shown a considerable decline since 1941. This year taxes amounted to $1,870,000,000, whereas in 1941 taxes were about $2,150,000,000, another indication of wartime shrinkage of the civilian motor vehicle supply. The figure for 1945 includes $578 million in special motor truck taxes, an increase of $25 million over the figure for 1941, an indication of the heavy tax burden the truck industry is carrying.

Of 41,790 automobile dealers in business at the time of Pearl Harbor, 33,000 still were operating at the close of the war, an indication of the financial strength and resourcefulness of automotive merchandisers.

Behind it, however, the auto industry has a superb record of war production achievement. Deliveries to the government and our Allies from the beginning of the war to the cancellation of war contracts are estimated by the AMA as follows:

		Pct.
1. Aircraft, aircraft subassemblies and parts...	$11,244,857,000	38.8
2. Military vehicles and parts	8,591,143,000	29.7
3. Tanks and parts	3,781,356,000	13.1
4. Marine equipment	1,951,658,000	6.7
5. Guns, artillery and parts	1,589,841,000	5.5
6. Ammunition and components	907,535,000	3.1
7. All other war products	903,610,000	3.1
Total	$28,970,000,000	

IN the midst of the retrospect for 1945 and the anticipations for 1946, the newest competitor in the industry, Kaiser-Frazer Corp., has been sawing publicity wood on a grand scale. Pictures of the new Frazer car have been released, and indicate an excellently styled model, not at all revolutionary but definitely advanced in its design thinking. The body utilizes the extreme width of the car, fenders becoming an integrated part of the body. The accommodation of four persons in the rear seat is promised, although the vehicle classifies as a 6-passenger automobile. The rear seat, incidentally, is placed forward of the rear axle for smoother riding and elimination of the rear floor tunnel, together with increased head room. Pillar posts are moved back at the front to provide greater visibility, and the contoured rear window is unusually large.

With overall height of only 64½ in., one of the lowest cars in the industry, the Frazer provides normal road clearance. Interior is nicely styled, using chrome, plastics and lucite for appointments. Outside door handles are firmly attached at both ends, eliminating clothing catching protrusions. Inside door controls are recessed and concealed, of the push-button type.

Meanwhile, the company announced plans for expansion of its manufacturing facilities—as yet

hardly more than blueprints—by selection of a California plant as a center of West Coast production operations. Both the Frazer, which will sell in the $1500 bracket, and the lower priced Kaiser, intended to be competitive with Ford, Chevrolet and Plymouth, will be produced there. Conversion of this plant, its locale still unrevealed, is to begin shortly. In charge of operations at the western site will be Edgar Kaiser, oldest son of the shipbuilder—chairman of the company.

Car Manufacturers Plagued By Shortages of Materials and Equipment

Chicago

• • • **With record passenger** and freight car orders piling backlogs higher every day, railroad car manufacturers continue to be plagued by materials and equipment shortages.

Passenger car manufacturing schedules of Pullman-Standard Car Mfg. Co. have been slowed down to keep pace with available materials, C. A. Liddle, president, reported last week. He labeled most critical steel, lumber, aluminum, air conditioning equipment, roller bearings, air brakes, motors and fabrics, and attributed much of the difficulty to strike conditions in suppliers' plants since last October.

"Our assembly lines today are pacing delivery of materials and supplies," he said. "This makes it difficult to plan a continuous production line. Instead of being able to apply materials in their proper sequence we are being forced to go only so far as material lasts, shifting to other operations in odd relation to their normal position on the line when and if shipments of new materials arrive.

"Just as soon as these conditions are ironed out and an adequate flow of materials is available, it is within Pullman-Standard's capacity to produce more passenger cars in one year than we produced in the entire ten year period from 1933 until 1942, when the production of all passenger cars was halted."

Since the New York Central placed an order for 22 complete streamlined passenger trains, including 420 cars of various types, with Pullman-Standard, Budd and American Car and Foundry, car manufacturers have been tossing around order statistics resembling the national debt. Pullman-Standard, Dec. 20, booked an order for 180 streamlined, air conditioned passenger cars for the New York, New Haven and Hartford railroad at a cost approximating $13 million. Of the total, 100 will be coaches, 10 will be dining cars and 15 will be grill cars. The balance will consist of several types of ultra modern lounge, parlor and observation cars. The order is subject to approval by the Federal Court at New Haven.

The industry is speculating upon the invitation to bid on 1000 lightweight sleeping cars issued by Chesapeake and Ohio Railway Co. which would involve an expenditure of $80 million to $100 million and would constitute the largest single sleeping car commitment ever made. Since a purchase of this size would increase sleeping car operations of the C and O group ten times from the 1940 level of approximately 100 cars, the possibility has been discussed that C and O may offer sleeping cars to other lines. Controlling interest met an initial reversal in efforts to acquire the sleeping car business of Pullman, Inc. Of added significance is the announcement that "invitation has been extended to some firms that have not heretofore built sleeping car equipment as well as to established car builders" in view of the government's monopoly action against Pullman.

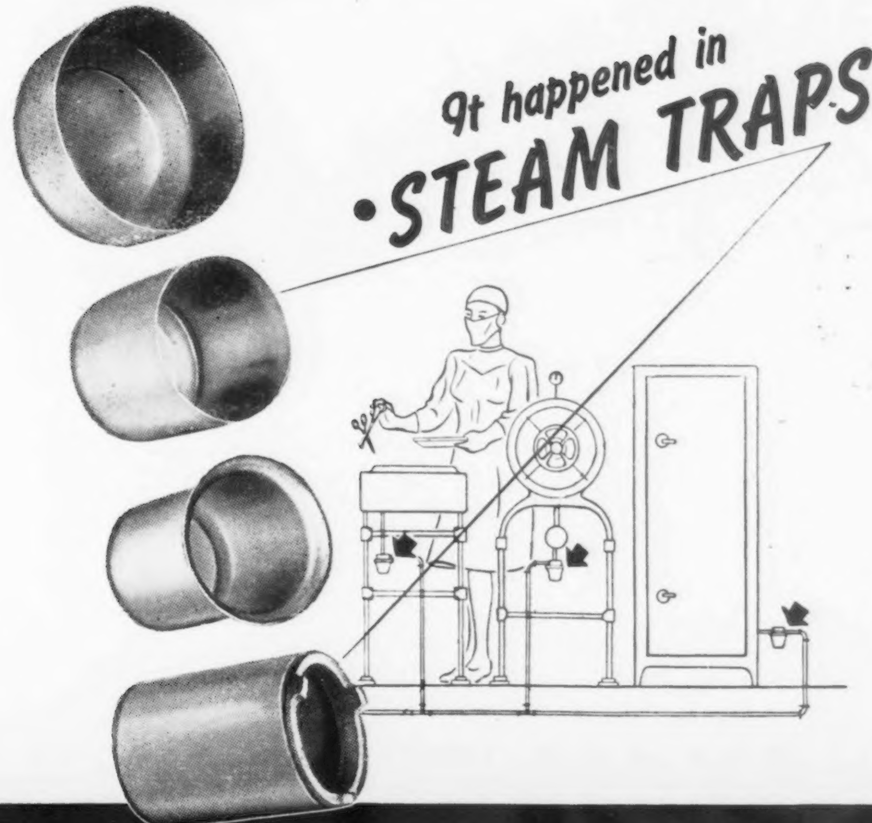
Freight car awards in the past fortnight have topped 2000 units. Bessemer and Lake Erie has ordered 500 70-ton hopper cars from Pullman-Standard and 250 from Pressed Steel Car Co. Union railroad has placed 500 cars of the same type with Greenville Steel Car Co. Elgin, Joliet and Eastern has ordered 300 50-ton gondolas and 200 50-ton flats from American Car and Foundry, and 75 70-ton covered hoppers from General American Transportation Corp. Forty 70-ton gondolas have been purchased by Donora and Southern Railroad from Mago Car Corp. Newburgh and South Shore Railway has given Magor orders for 100 70-ton gondolas. General American Transportation Corp. will build 25 70-ton covered hoppers for Northampton and Bath Railroad, and Pressed Steel Car Co. will build 20 50-ton dump cars for National Tube Co.

THE NEW FRAZER: *This is an artist's conception—and not very far away from the real thing—of the new Frazer automobile. The car has wheelbase of 123½ in. and a Continental 6-cylinder 100-hp engine. The body lines, developed by Howard Darrin, are reminiscent of the Chrysler Airflow, which was put out many years before its advanced lines were to become popular, by Chrysler Division while Joseph W. Frazer was the company's sales chief.*

Rustless-Armco Merged

Baltimore

• • • **Calvin Verity**, president of Rustless Iron & Steel Corp., announced that at the meeting of stockholders held Dec. 28 the agreement of merger of Rustless into the American Rolling Mill Co. was adopted by the favorable vote of 84.5 pct of the outstanding stock. The shareholders of the American Rolling Mill Co. had previously adopted the agreement of merger.



When Carpenter made Stainless EASY TO DRAW

For steam trap buckets that must withstand corrosion from all types of water found throughout the country and operate in temperature ranges up to 750°F., the need for *Stainless* Steel is self-evident.

But steam trap buckets must be deep-drawn—and not so many years back that wasn't an easy job with *Stainless*. Today, thanks to Carpenter's development of soft, ductile *Stainless* Strip, the steam trap bucket above was drawn to a cup depth of 3½" in three easy draws. Moreover die wear was cut, rejects were reduced and production increased.

Yes, it happened in steam traps and it can happen in your new or redesigned products. The common denominator in obtaining best *Stainless* fabricating results is uniform, easy-working Carpenter *Stainless*. And by choosing Carpenter *Stainless* you get the extra advantages of high strength/weight ratio, corrosion, heat and wear resistance, special physicals and gleaming eye appeal.

Make use of the diversified *Stainless* experience of your nearby Carpenter representative to improve your products. He has helped hundreds of other manufacturers find the successful solution to their *Stainless* requirements. He can help you, too. Call him today or write us at the mill.

THE CARPENTER STEEL CO., 121 W. BERN ST., READING, PA.

Carpenter STAINLESS STEELS

...for
- Strength
- Rigidity
- Heat Resistance
- Corrosion Resistance
- Longer Product Life
- Sales Appeal

BRANCHES AT
Chicago, Cincinnati, Cleveland, Detroit, Hartford, Indianapolis, New York, Philadelphia, Providence, St. Louis

Washington . . . L. W. MOFFETT

• Administrative Procedure Act, a bill prescribing fair procedures for improving the administration of justice, awaits congressional action.

WASHINGTON — Culminating a decade of efforts to settle and regulate the field of federal administrative law and procedure, an omnibus bill to improve the administration of justice by prescribing fair administrative procedures has been reported favorably by the Senate Judiciary Committee and awaits action after Congress reconvenes Jan. 14. A companion bill has been introduced in the House.

The Administrative Procedure Act, as the bill is called, is not to be considered an indictment of administrative agencies or processes. In the report which recommended passage, the Senate Judiciary Committee declared that enactment of the bill by Congress will provide policy guidance for all branches of the government and private interests with respect to minimum requirements of fair administrative procedure.

Except for the informational requirements of the act, such agencies as the National War Labor Board, National Railroad Adjustment Board, Selective Service, Office of Contract Settlement, Surplus Property Administration, military tribunals, civil courts and the governments of the possessions, territories and the District of Columbia are exempt from provisions of the bill. Functions which expire on the termination of hostilities or before July 1, 1947, are also not covered.

The bill, as reported, is not intended to specify the details of bureau procedure nor to modify administrative law but is designed to afford parties affected by administrative powers a means of knowing what their rights are and how they may be protected. At the same time, government administrators are provided with a simple course to follow in making administrative determinations.

Provisions for public information, administration and judicial review are included. What the bill does in substance may be summarized as follows:

(1) It provides that agencies must issue certain specified information as to their organization and procedure and, at the same time, make available other administrative information.

(2) The essentials of several forms of administrative proceedings and the limitations on administrative powers are set forth in outline form.

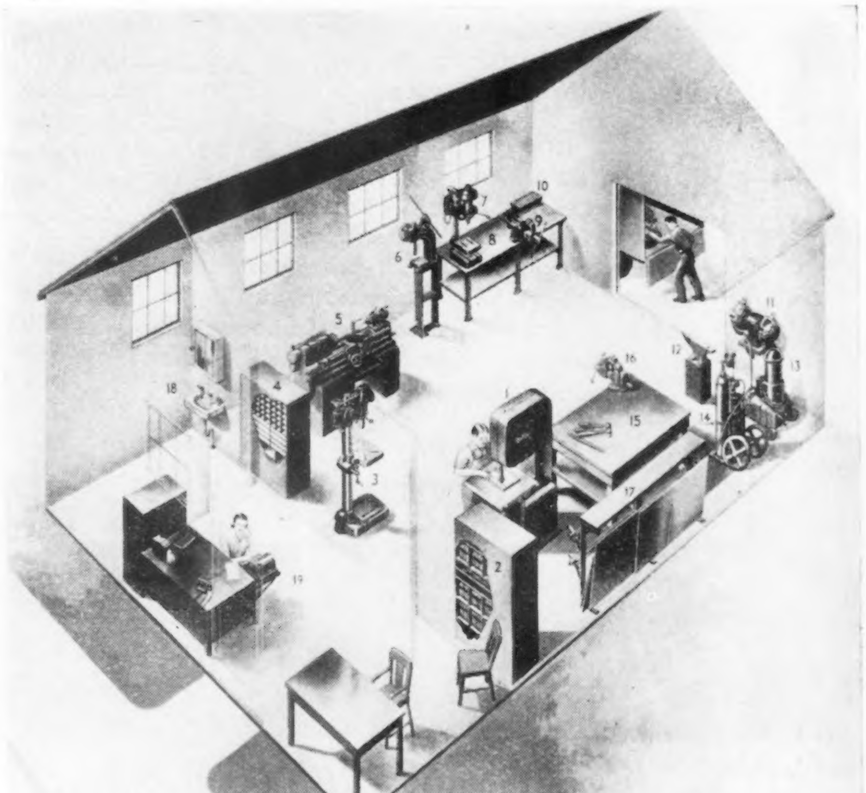
(3) Details requirements for administrative hearings and decisions in cases requiring hearings under statutes.

(4) Sets forth a simplified statement of judicial review designed to afford adequate remedies for every legal wrong.

Under the provisions of the bill, S. 7, government agencies are required to take the initiative in informing the public. In stating the essentials of administrative procedure, the bill carefully distinguishes between the so-called legislative functions of government agencies whereunder general regulations are issued and the judicial functions which involve determination of rights and liabilities in particular cases.

In the legislative or rule-making functions, the bill provides that agencies must publish notice in the Federal Register and at least permit interested parties to submit their views in writing for consideration by the agency in-

REDUCED OVERHEAD: *The DoAll Co., Des Plaines, Ill., has made plans of a streamlined machine shop for G.I.'s who desire to go into business for themselves. Equipment includes:* (1) *contour sawing machine,* (2) *supply cabinet,* (3) *drill press,* (4) *tool cabinet,* (5) *lathe,* (6) *arbor press,* (7) *bench drill press,* (8) *toolmaker's bench,* (9) *vise,* (10) *bench plate,* (11) *tool grinder,* (12) *anvil,* (13) *electric arc welder,* (14) *oxyacetylene welder,* (15) *rough bench,* (16) *vise and* (17) *stock storage rack.*



volved before general regulations are issued. Similarly, in the adjudicative or judicial functions hearings are not required unless so provided by statute, in which case the bill would prescribe the mode of hearing and decision. Where under existing statutes administrative rules or orders are made after hearings before a government agency, the bill spells out the minimum requirements for such hearings, states how decisions shall be made thereafter and provides for selection of examiners to preside at hearings and make or participate in decisions.

The provisions of the bill can be classified into five types: (1) Definitive setting forth titles and rules of construction; (2) informational requiring public notice; (3) procedural providing for rule making, adjudications and other matters; (4) details for hearings and decisions; and (5) providing for judicial review.

ALTHOUGH drawn up after exhaustive hearings and considerable research by Congressional groups, supplemental legislation will no doubt be necessary. This is true, according to the Committee report, of the proviso that exempts rule making and determination of initial license applications from coverage by the bill. In this connection, where cases involve sharply contested issues of fact, government agencies should not as a matter of good practice take advantage of such exemptions. Also, provisions which might serve as loopholes to circumvent the examiner system set up by the bill would conceivably require supplemental action by the Congress.

One particularly important provision which may require subsequent amendment is that which pertains to evidence. Should the requirement that agency actions be supported by plainly "relevant, reliable and probative evidence" prove insufficient to maintain the standards of proof, corrective legislation will be required. The term "substantial evidence" may run into difficulty due to the practice by some agencies of relying on suspicion, surmise, implications or, in some instances, plainly incredible evidence.

Inasmuch as enforcement of the proposed law will be conferred upon the civil courts in the final analysis, it will be their duty in reviewing agency decisions to prevent direct or indirect avoidance of the stipulated requirements and to determine the meaning of the words and phrases used. However, since in the vast majority of cases the government agency concerned usually acts with finality, the agencies themselves will have to make the first, primary and most far-reaching effort to comply with the terms and the spirit of the bill.

In 1937 the situation had become such that a Committee on Administrative Management was appointed by the President to make a comprehensive survey of and suggestions concerning administrative methods overlapping functions and diverse organization among government agencies. Commenting on the Committee's report which recommended complete separation of investigative-prosecuting functions from rule-making functions, the late President Roosevelt pointed out that the practice of creating independent regulatory commissions which perform administrative work in addition to judicial work threatened to develop a "fourth branch" of government for which there is no sanction under the Constitution.

In 1938 the Senate Judiciary Committee held hearings on a bill which proposed to establish an administrative court. A year later, the Walter-Logan administrative procedure was passed by Congress but was vetoed by the President partly on the ground that an overall report by a special committee appointed to investigate the executive branch had not been reported.

Pursuant to recommendation by the Attorney General in 1938, the President appointed a group, which came to be known as the Attorney General's Committee on Administrative Procedure for the purpose of surveying existing practices and procedures. Growing out of that Committee's work, several bills were introduced in 1941 but owing to the then tense international situation, further consideration of the matter was postponed indefinitely.

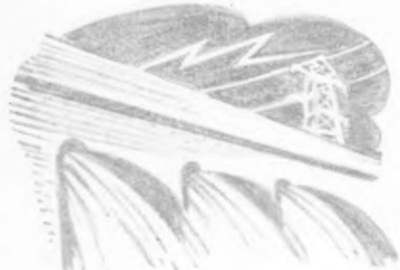
The bill in its present form has been approved by the Attorney General. In a recent letter to Senator Pat McCarran, D. of Nev., Chairman of the Senate Judiciary Committee, the Attorney General declared, "The bill appears to offer a hopeful prospect of achieving reasonable uniformity and fairness in administrative procedures without, at the same time, interfering unduly with the efficient and economical operation of the government."

THE BULL OF THE WOODS BY J. R. WILLIAMS

West Coast . . .

OSGOOD MURDOCK

• West Coast looks for high volume of industrial activity but views with alarm the tough problems of the immediate future, especially labor troubles.



SAN FRANCISCO—As the year ends, West Coast industry finds itself confronted with every prospect of a high volume of activity, but deeply concerned with a series of problems the solutions to which lie largely in other people's hands.

A horseback survey of a dozen basic industries which constitute the economy of the West discloses the fact top executives foresee a period of high productivity, but analysis of their reactions indicates an almost insurmountable group of obstacles to be overcome before the future may be assayed with any degree of confidence.

Leaders of their respective industries summarize their own prospects in the following vein:

AVIATION—On the credit side of the ledger: The finances of these firms are, almost without exception, in superb condition. Plant and equipment have emerged from the war period in as good shape as that of their treasuries. Production and engineering have attained a high degree of maturity. Military and commercial orders are maintaining a dollar volume generally higher than prewar.

On the debit side: Abrupt and unheralded cancellations from the military disrupt production. Total absence of a coherent government policy throws a pall over any attempt at constructive planning. Surplus planes identical to those now on production lines are being sold at prices below manufacturing costs. Severe competition from firms not now engaged in airline business is anticipated. Future of private flying lies largely in the hands of government disposal agencies.

Addendum: Securities quotations for these companies—one index to the future—are making all-time highs.

CANNING AND PACKING: Peak volume and invisible selling costs have left treasuries bulging. Plant is in fine shape. Machinery has replaced scarce wartime labor in many operations and lowered production costs. Acreage is up. Per capita consumption reached the highest peak in history, and is never expected to slip back to a point as low as prior to the war. All indications point to high volume.

Considerable plant expansion occurred under impetus of armed forces consumption and may generate intense competition. Some leaders say that the military must dispose of holdings to avert serious shortages in some items. Tin prospects for the coming year are not too rosy. Farm prices must recede from inflationary peaks, or it will be economically impossible to pack certain lines.

LUMBER: Demand insatiable, prices pushing ceiling levels and breaking through for export. Revenue from by-product manufacture mounting finances fine. Number of small producers with low overhead increasing. Tight squeeze between inflexible prices and mounting labor costs developing, especially in the case of marginal producers. U. S. Forest Service clamp down on cutting in certain areas is throwing some firms out of business. As logging areas recede from mills, costs are mounting. Some firms cut themselves out of business during the war. Labor problems still unsettled.

MINING: Increasing western industrial activity presages sizeable expansion of nonmetallic mining of salt potash, borax. Refractory clays and ceramic clays show signs of good times coming. Terra cotta clays to be in heavy demand architecturally when, as, and if building activity resumes.

Gold mining at $35 an ounce is virtually threatened with extinction if legislative relief is not granted by Congress and monetary policy setting bodies. Chrome, quicksilver, tungsten and manganese require strong stockpiling federal policies or else they are again slated for near-oblivion.

Addendum: Mining economists declare that gold prices are ultimately due to hit the $50 mark. But the question is what to do till the doctor comes.

OIL: Roaring demand for each category of fuel and lubricant. Broadened demand offers sound product diversification possibilities. Industry enjoyed high war priorities, plant in good shape. Finances are stable. Reserves are more critical in the equivocal opinion of Harold Ickes than in that of the industry; some evidence that technological developments may relieve pressure. Less drilling competition due to increased costs. Byproduct demand —chemical and plastics—is increasing labor, a continuing problem. Bunker facilities for armed forces may shift load to Panama. Construction materials, sheet, structurals, motors and compressors scarce, and therefore a constrictive factor.

PAPER: Demand and supply in healthy balance. Plant in good condition, and competitive-wise in particularly happy state. Finances, tip-top.

Some areas and some firms are cut out. Prospects of importation are in the offing, but of no immediate concern.

RAILROADS: Flush with war traffic, finances are superlative; one road has reduced annual interest charges by 31 pct, for example. Plant and equipment in as good shape as can be expected and cash available for new purchases. New rolling stock to reflect substantial savings in operating

...Many Hardened in 1/3 Former Time

THE above report on the TOCCO hardening of 79 parts for Cooper-Bessemer engines and compressors appeared in July, 1943. Since then, the production of 63 more parts has been assigned to this versatile "one-man heat-treating department."

These 142 parts range in size from ½ oz. set screws to 186-lb. cross-head pins. Materials include SAE 52100, SAE 1050 modified, NE 8620, Meehanite, as well as carburized low-carbon, carbon and alloy steels. All are hardened on the same TOCCO machine.

TOCCO cuts the hardening time of many of these parts 75%; eliminates straightening; reduces machining and grinding; provides better working conditions.

Find out how versatile, speedy TOCCO Induction Heating can improve *your* products, step up *your* output and cut *your* costs. The 32-page book, "Results with TOCCO," free on request.

THE OHIO CRANKSHAFT COMPANY • Cleveland 1, Ohio

JUST PUSH A BUTTON

TOCCO

INDUCTION

HARDENING, BRAZING

ANNEALING, HEATING

costs during coming tourist-travel boom. Western industrialization will generate freight at levels higher than prewar.

Wages are perhaps the most serious problem confronting the industry. Could have a serious effect on what otherwise is a splendid outlook. Probable necessity for higher rates, and time element could put the industry in a vise between increased costs and inflexible rates. Serious shortage of track labor. Management would sing pæans if bureaucrats and attorneys could all go home.

SHIPPING: Portents for tonnage excellent. Population increases and industrial activity can have nothing but a salutary effect on coastwise and intercoastal. Feeding and rehabilitation of foreign countries indicates inordinate transoceanic volume. Population increases and stimulated business activity in Hawaii and Alaska also offer promising prospects.

Ship disposal bill now before Congress is Gordian Knot, Sword of Damocles and possible death knell all rolled in one. Governmental policy will dictate fate of entire industry. Shipping men say that the present bill would wipe the American Merchant Marine off the Seven Seas. Labor costs have soared and lines will have a tough time with operating costs when ships are returned from USA. Armed forces are keeping best ships for their own use. Probable necessity for continued ship construction. Even if returned to American operators, ships will require conversion to handle trade. Huge sums required for ship acquisition and present dubious tax structure offers the industry a pretty peck of speculative problems.

STEEL: Demand healthy. Finances of old line companies, substantial.

Labor is the immediate problem. Even overlooking the implications of an industrywide strike, the quality and quantity of steel labor on the West Coast will afford management with a hefty parcel of imponderables. The question of costs and prices lie in the limbo of the future. And as for productive capacity and (again) prices and competition—that thunderous off-stage sound is the rattling of the dice boxes of the Gods of Chance and the roar of Geneva's furnaces.

UTILITIES: In beautiful condition both financially and taxwise. Population and industrial additions all to the good. In point of possible adverse legislation the pressure appears to be continually easing. Earnings remain sound as rates pursue a downward trend, even in competition with public ownership. Per capita consumption reached a high peak and although some regression has been observed, it is expected to stabilize at higher than national levels.

The network of gigantic dams constructed under Federal auspices remains a continuing threat. Some clouds on the labor horizons.

ASME Forms General Machine Design Group

Cleveland

• • • **Recognizing the ever-increasing** importance of the field of design, the American Society of Mechanical Engineers has sponsored the formation of a Machine Design Group. Organized primarily for the presentation of technical papers of interest to machine designers generally, rather than to any specific branch of industry, the new group may later assume the status of a full-fledged professional division should interest continue to increase among ASME members and others active in design.

Chairman of the group is J. F. Downie Smith, head of the engineering department at United Shoe Machinery Corp.'s Research Div., the secretary being B. P. Graves, director of design, Brown & Sharpe Mfg. Co. Plans are under way for a machine design session at the semiannual meeting of the Society in Detroit next June, and consideration is being given to the scheduling of joint sessions with other professional divisions where desirable.

Forms New Steel Company

Pittsburgh

• • • **Organization of** the Chester Electric Steel Corp., for the production of carbon, alloy and stainless steel castings, was announced recently by Fred Grotts, president.

Mr. Grotts, former president of Fort Pitt Steel Casting Co., said the new company had acquired the Crum Lynn Foundry at Chester, Pa., built and formerly owned by the Reconstruction Finance Corp., and operated by the Atlantic Steel Foundry Co., during the war.

Stanley J. Roush is vice-president and treasurer of the new organization, and William Burrough and Sam Nicholson are plant manager and sales manager, respectively.

Pricing Amendment 9 Disputed by Dealers

Chicago

• • • **Some second hand** machine tool dealers have been heavily hit by amendment 9 to Maximum Price Regulation 1 changing the formula for calculating selling prices of used machine tools on the basis of age.

Sudden announcement of the amendment, effective Dec. 22, caught some dealers stocking heavily on older tools in anticipation of selling on the previous formula. Resentment is voiced that longer warning was not given of the announcement of the change and that the industry was not called into consultation regarding its effect. The dealers insist that they will take heavy inventory losses on older tools working a particular hardship on smaller concerns.

One dealer cited the case of a machine built in 1924 having a base price of $5000. Under the previous formula, he stated, the machine would have a ceiling of $4000 if rebuilt and guaranteed or $2750 "as is." Under Amendment 9 pricing, it is stated, the machine would have a ceiling of $3000, rebuilt and guaranteed, or $1750 "as is."

No formal protest yet has been made pending clarification of the regulation.

European Letter . . . JACK R. HIGHT

• Britain holds first major postwar industrial exhibition... Sponsored by the Gage & Toolmakers' Assn. . . . Special interest in handicapped persons.

LONDON—The first major postwar industrial exhibition in Britain is being held here Jan. 7 to 18 inclusive by the Gage & Toolmakers' Assn. Special interest is being shown by the exhibitors in the sale of precision testing gages for use by physically handicapped persons, as well as in the display of many lines of press tools.

The exhibit is considered an important part of the export drive being carried on by the trade here, and is expected to attract large numbers of foreign visitors. Special translating facilities are being made available for this purpose. The export market for British precision tool makers is already the subject of an advertising campaign being carried on in Australasia, South Africa, Canada, India, Russia, China, Spain and the Latin-American countries.

The exhibit, to be held in New Hall, Vincent Square, London, will be opened by the British Minister of Supply, Rt. Hon. John Wilmot, M.P., in special ceremonies. Space for exhibits includes 20,000 sq ft and will be occupied by approximately 90 exhibitors, including makers of gages and measuring equipment; jigs, fixtures and special tools; special purpose machines; press tools; molds and dies; and diamond tools and gages.

The fact that a large percentage of manufacturers taking part are offering various types of press tools is interpreted here as a trend away from the use of large numbers of light castings in favor of press work.

In recognition of the British Government's plans that all industry shall be compelled to accept for employment a fair share of disabled persons (about 2 pct) a variety of specially designed measuring devices is to be on display. Included in this group is a Braille micrometer, developed by Moore and Wright, of Sheffield, at the request of the National Institute for the Blind, and with the assistance of blind craftsmen. The instrument has been fully tested, and is said to be capable of rapid handling with accuracy to 0.0001 in.

In the same line Sigma Instrument Co., Ltd., Letchworth, has developed an electrical visual indicator for checking of components to predetermined limits. Now being produced for a variety of installations, this system uses a micrometer screw at the head of the instrument for independent setting of the plus and minus limits. When the contact pointer meets the work, indicator lights show amber for oversize, green for acceptable work, and red for undersize. On the same firm's display will be an audible system working on the same basic principle.

SPECIAL interest of the National Physical Laboratory, government sponsored research group in the subject of surface finishes will be demonstrated, with a new electrical stylus recording instrument in operation. This work is but one part of a very wide interest being developed here and on the Continent in this subject, where other measuring systems are being investigated.

Also on display by the National Physical Laboratory will be special equipment developed by the group for the following purposes:

FLASH-BUTTWELDING: *Sheet metal plates are so welded by this machine to be on display in London as part of the Gage & Tool Makers' Assn. exhibition. The machine is offered by S. Carlton Smith, Ltd., Dunstable.*

(1) Calibration of sets of slip gages.

a—Slip gage interferometer for direct measurement of the most accurate grade in terms of wavelengths of light to an accuracy of 0.000001 in.

b—Eden-Rolt millionth measuring machine for comparative mechanical measurements of inspection and workshop sets, using reference standards calibrated on the interferometer.

(2) Testing of circular dividing apparatus.

a—Tomlinson angle blocks consisting of 12 angle standards capable of forming, by wringing, a large number of combinations in steps.

b—Precision polygon with nominally equal included angles between adjacent pairs of facets.

(3) Inspection of complicated types of gages, jigs, and other work. The measurement of positional features or of dimensions involving angular and linear components is considerably simplified by methods specially developed for use with circular dividing apparatus, such as the universal measuring block or optical dividing head, supported on a surface plate.

(4) Testing of marine gears.

a—Portable pantongraph for obtaining smoked glass records of gear tooth profiles.

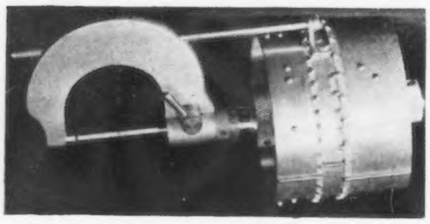
b—Portable base pitch gage for measuring base pitch of large gear wheels and pinions.

(5) Multiple inspection of components by pneumatic gaging.

a—Demonstration of the basic principle of pneumatic gaging by means of a nozzle delivering air at relatively high pressure.

b—Air operated multiple gage for measuring six dimensions in one operation.

EVIDENCE of Britain's warborn proficiency in the production of optical measuring equipment will be demonstrated in the display of Optical Measuring Tools, Ltd., Slough. Shown will be an optical comparator with a magnification of approximately 1000 to 1 and scale graduations in divisions of 0.00005 in. The comparator handles work up to 7 in. height and 6 in. diameter. Also on display in this line will be optical flats, toolsetting microscopes, optical circular tables, and an inclinable table.



BRAILLE MICROMETER: *Developed for use by handicapped persons, a full line of special measuring instruments will be displayed in London. Blinded craftsmen aided in the development of this example.*

The Gauge and Tool Makers' Assn. was organized in 1942 and now boasts a membership of about 200 firms. It assisted government departments in coordinating the efforts of the industry during the war, and is leading the drive among the group for postwar expansion in the export field.

RFC Moves Surplus Disposal Headquarters

Pittsburgh

• • • **According to** officials of the Surplus Property Division of the RFC, authority to complete sales of surplus tools, equipment, and metals will be transferred to the Pittsburgh Office of the RFC instead of continuing the practice of completing negotiations through the Cleveland RFC Office. The Smaller Manufacturers' Council has been attempting to bring about this transfer for some time in order to speed up processing in the surplus sales.

Records pertaining to the surplus equipment in the Pittsburgh area are being transferred from Cleveland to Pittsburgh and the local office will be in a position to negotiate sales on cash or extended credit accounts, thus affording prospective purchasers an opportunity to obtain an immediate direct answer on materials and equipment in the area.

Accounting and pricing of surplus commodities will still be handled by the Cleveland Office as these items are declared surplus by the various services. There is some feeling among Smaller Manufacturers' Council members that this latter procedure might still cause some delay in sales of surplus items, and if it should, the Council will undoubtedly attempt to have this phase of the work likewise transferred to Pittsburgh.

—Illingworth in *Daily Mail*

PERSONALS

° ° °

• **L. S. Marsh,** formerly manager of the dept. cf inspection and metallurgy in the Chicago office, and **J. D. Macomb,** manager of sales engineering, Railroad Sales Div., Inland Steel Co., have retired. Mr. Marsh has been with the company since 1922, and in 1926 organized the dept. of inspection and metallurgy, of which he was manager for 19 yr. Mr. Macomb has been assistant to the vice-president and subsequently manager of sales engineering of the Railroad Sales Div. for 18 yr.

• **Leroy D. Greene** has retired as assistant purchasing agent of Bethlehem Steel Co., Bethlehem, Pa. His first position was with the Boston Navy Yard. Subsequently he entered the employ of the Fore River Shipbuilding Co., at the time a subsidiary of Bethlehem Steel and now the Quincy, Mass., yard of Bethlehem. In 1926 he came to Bethlehem, and 6 yr ago was made assistant purchasing agent.

• **H. S. Hoyt, Jr.,** recently honorably discharged from the U. S. Army Air Force, has joined the Boston office of A. Milne & Co.

• **C. A. Woodbury,** manager of the Technical Div. of E. I. du Pont de Nemours & Co.'s explosives dept., Wilmington, Del., and **I. J. Cox,** manager of the American glycerin section and production manager of the black powder section, have retired. Mr. Woodbury will be succeeded by **Dr. B. H. Mackey.** The duties of Mr. Cox in the American glycerin section will be taken over by **G. H. Loving,** an assistant director of sales of the explosives dept., and those in the black powder section will be taken over by **H. K. Babbitt,** production manager of the special products section.

• **Fred Reiser, Jr.,** Cincinnati district manager for the Industrial Div. of the Timken Roller Bearing Co., Canton, Ohio, since 1944, has been named division manager for all divisions of the company there, including Industrial, Steel, Automotive, and Service-Sales. **Harry McCool,** who joined the Timken Roller Bearing Co. in 1928 as a hot mill operator, has been appointed sales engineer for the Steel & Tube Div. of Cincinnati district, which includes Indiana, Kentucky and part of Ohio

• **W. S. Mounce,** formerly senior metallurgist with the Hamilton Standard Propellers Div., United Aircraft Corp., East Hartford, Conn., has joined the Development & Research Div. of the International Nickel Co., Inc. He will make his headquarters at the New England technical section of the division at Hartford, Conn.

• **Paul W. Wishart** has been named vice-president in charge of factory operations of Minneapolis-Honeywell Regulator Co., Minneapolis. Also elected vice-presidents were **Arthur H. Lockrae,** heating controls dept.; **John E. Haines,** commercial controls; and **C. D. Lyford,** sales to the gas industry.

ARTHUR B. HOMER, president, Bethlehem Steel Corp.

• **Arthur B. Homer,** vice-president in charge of the Shipbuilding Div. since May 1940, has been elected president of the Bethlehem Steel Corp. He has been associated with Bethlehem since 1919, his entire business career being with the company. After holding various posts in engineering, production, and sales, he became a director of the corporation and vice-president in 1940. **E. G. Grace** has been elected chairman of the board and in that position will continue as its chief executive officer.

• **Norman A. Schassberger,** formerly chief body engineer of Willys-Overland Motors, Inc., has joined Kaiser-Frazer Corp., Willow Run, Mich., in a similar capacity. **G. F. Petersimes,** works manager of the Chrysler Lynch Road plant during the war, has been appointed manufacturing manager of Kaiser-Frazer.

• **George Lowe** has been appointed general staff manager-sales of Carnegie-Illinois Steel Corp., Pittsburgh, U. S. Steel subsidiary. He was first employed by Carnegie-Illinois in 1942 in the president's office as supervisor, new business research, the position he leaves to fill his new appointment.

• **B. A. Springer,** hydraulic press and power tool engineer, has become a sales engineer for the Baldwin Locomotive Works. Mr. Springer will be with the Chicago office of the Southwark Div. of Baldwin and will specialize in hydraulic presses.

• **C. C. Gerow,** first director of sales for Hercules Powder Co., Wilmington, Del., has retired after more than 47 yr in the explosives industry. Mr. Gerow was one of the first three men employed by Hercules when the company was formed in 1912.

• **Capt. Thomas B. Doe,** vice-president, the Sperry Corp., New York, and its subsidiaries, has been elected president of the corporation, succeeding **Thomas A. Morgan,** who becomes chairman of the board and remains chief executive officer.

• **H. E. McPherson** has been appointed assistant manager of sales of Republic Steel Corp.'s Union Drawn Steel Div., Massillon, Ohio. His return to Republic after 39 months active duty with the U. S. Army, continues an association which began in 1928.

• **Horace A. Deane,** works manager of the Brake Shoe & Castings Div. of American Brake Shoe Co., New York, has been appointed a vice-president of the division. Mr. Deane is in charge of operations in 18 of the company's 57 plants, and is responsible for the production of brake shoes and miscellaneous iron castings.

OBITUARY...

• **Edgar A. Blasdell** died Dec. 8. He was an officer of Reliance Steel Casting Co. from 1910 to 1932, and had been president since 1932.

• **George E. Smith,** 55, vice-president of the Midvale Co., Philadelphia, died suddenly Dec. 12.

• **Bryson D. Horton,** founder of the Square D Co., Detroit, and president until 1928, died recently at Ann Arbor.

Dear Editor:

PLASTER DIES AND FORMS

Sir:

Will you please send two reprints of the following article which appeared in the Nov. 22 issue: "Form Dies of Resin Impregnated Plaster" by John Delmonte.

MICHAEL WATTER,
Chief of Development Engineering
Edward G. Budd Mfg. Co.,
Philadelphia 32

● Reprints of this article have not been made, but we are forwarding tear sheets to you.—Ed.

COLOR MERCHANDISING

Sir:

I am interested in the article appearing on p. 77 of the Dec. 6 issue entitled "Color Merchandising of Metal Products" by Edward Engel. If a tear sheet of this article is available, will you please address to me.

GORDON HALE,
Sales Agent
Dominion Steel & Coal Corp., Ltd.,
Montreal

● Tear sheets have been sent.—Ed.

PACKAGING PUBLICATION

Sir:

Can you advise me of the name of the publication and address devoted to the packaging of materials and packaging machinery.

J. J. LAUDIG
Delaware, Lackawanna & Western R.R. Co.,
Scranton, Pa.

● Would refer you to Modern Packaging, Chanin Bldg., New York 17.—Ed.

HIGH-FREQUENCY HEATING

Sir:

On p. 72 of your issue of Oct. 4, you mention the Commonwealth Edison Co. in the article "Uncommon Applications of High-Frequency Heating." Please give us the address to write about this heating process.

LOGAN EISELE
Eisele & Co.,
Nashville 3, Tenn.

● The address of the company is 72 W. Adams St., Chicago 90.—Ed.

CONTINUOUS GAGING

Sir:

Will you please send us a reprint of your article entitled "Continuous Gaging with X Ray Micrometer" which appeared in the magazine issue under date of Nov. 29.

CYRUS A. POOLE,
Sales Manager
E. I. du Pont de Nemours & Co.,
Wilmington, Del.

● Reprints have not been made of this article; however, we are forwarding tear sheets.—Ed.

CROSLEY MOTORS LOCATION

Sir:

The West Coast editorial in the Sept. 13 issue states that the Crosley Motors, Inc. of Indianapolis are licensers and possible manufacturers of a light weight steel fabricated engine originally developed by Taylor Engines, Inc. We have been unable to locate Crosley Motors in Indianapolis, and would appreciate your supplying us with the correct address if possible.

HAROLD W. ZIPP,
Chief Engineer
Boeing Airplane Co.,
Wichita, Kan.

● We find that Crosley Motors, Inc., is in Cincinnati rather than Indianapolis and believe that a letter addressed there even without specific street address or box number will be received. It was an unfortunate error and oversight that we originally located the company at Indianapolis.—Ed.

PRECISION CASTING

Sir:

Enclosed herewith is our check in the amount of $1.20 to cover the cost of two copies of the booklet "Precision Casting—Lost Wax Process."

H. A. FOLGNER,
Manager
Handy & Harman,
Los Angeles

● Reprints have been mailed.—Ed.

HIGH TENSILE STEEL

Sir:

Kindly send tear sheets of the article entitled "Quality Control of High-Tensile Steel Castings" in the Nov. 29 issue.

E. I. VALYI
A.R.D. Corp.,
New York 5

● Tear sheets have been mailed.—Ed.

STEEL STRUCTURES

Sir:

We understand that among various other materials of the U. S. Army which are now open for sale, there are a great many steel structures, such an hangers and other types of buildings. If we are not mistaken, a special high tensile type of steel for structural shapes has been employed for these structures giving a minimum of weight. We presume that in average these structures have a roofing and walling of corrugated steel sheets. However, in any event it would interest us to obtain quotations for such structures with or without roofing and walling as we have the possibility to substitute with corrugated cement sheets which are being manufactured here. Owing to the enormous scarcity of construction material and also the high rents, we are certain that we would be able to sell hundreds of these structures which can easily be dismounted and shipped from your country and assembled here afterwards. At present we are interested in all kinds of structures ranging from 10,000 to 60,000 sq ft space.

COTECO
São Paulo,
Brazil

● Surplus steel buildings and structures now in the hands of the U. S. Army are being disposed of through the Surplus Property Administration, Washington, D. C.—Ed.

STEEL PUBLICATION

Sir:

Will you kindly send us a list of publications of books, booklets, pamphlets or any informative literature on the subject of steel.

SAMUEL SCHADEL
Ohio Industrial Steel Co.,
Dayton

● We would refer you to the book "The Making, Shaping and Treating of Steel," by J. M. Camp and C. B. Francis. It is published by Carnegie-Illinois Steel Corp., U. S. Steel Corp. subsidiary, Pittsburgh, at $10 per copy.—Ed.

BERYLLIUM COPPER

Sir:

We believe that some time ago you ran a story on beryllium copper. We are very interested in obtaining a copy of that article if possible.

JAMES J. HURLEY,
President
Hurley Mfg. Co.,
Winsted, Conn.

● We had an article on "Beryllium Copper, A Review of Its Properties," in the April 26 issue, which we are forwarding to you.—Ed.

GAS CARBURIZING

Sir:

We would appreciate receiving two or three copies of the articles "Gas Carburizing" by Ernest S. Kopecki, which were published in the Oct. 18 and 25 and Nov. 1 issues of THE IRON AGE.

W. A. WITHAM,
Asst. Manager of Engineering
Western Gear Works,
Lynwood, Calif.

● Tear sheets have been mailed.—Ed.

DILEMMA

Sir:

Please send us six copies of Mr. Van Deventer's editorial "The Four-Horned Dilemma" in your Dec. 6 issue. This sure hits the nail on the head.

A. L. JONES,
Secretary
Armstrong Machine Works,
Three Rivers, Mich.

● We are sending you six copies as requested.—Ed.

GERMAN CARBIDES

Sir:

We enclose herewith 30¢ in stamps and request that you send us two reprints covering the article which appeared in the Aug. 30 issue entitled "German Cemented Carbide Industry" by Gregory Comstock.

H. H. PURDY
Thomas Prosser & Son,
New York 5

● Reprints have been forwarded.—Ed.

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MUEHLHAUSEN SPRING CORPORATION
Division of Standard Steel Spring Company
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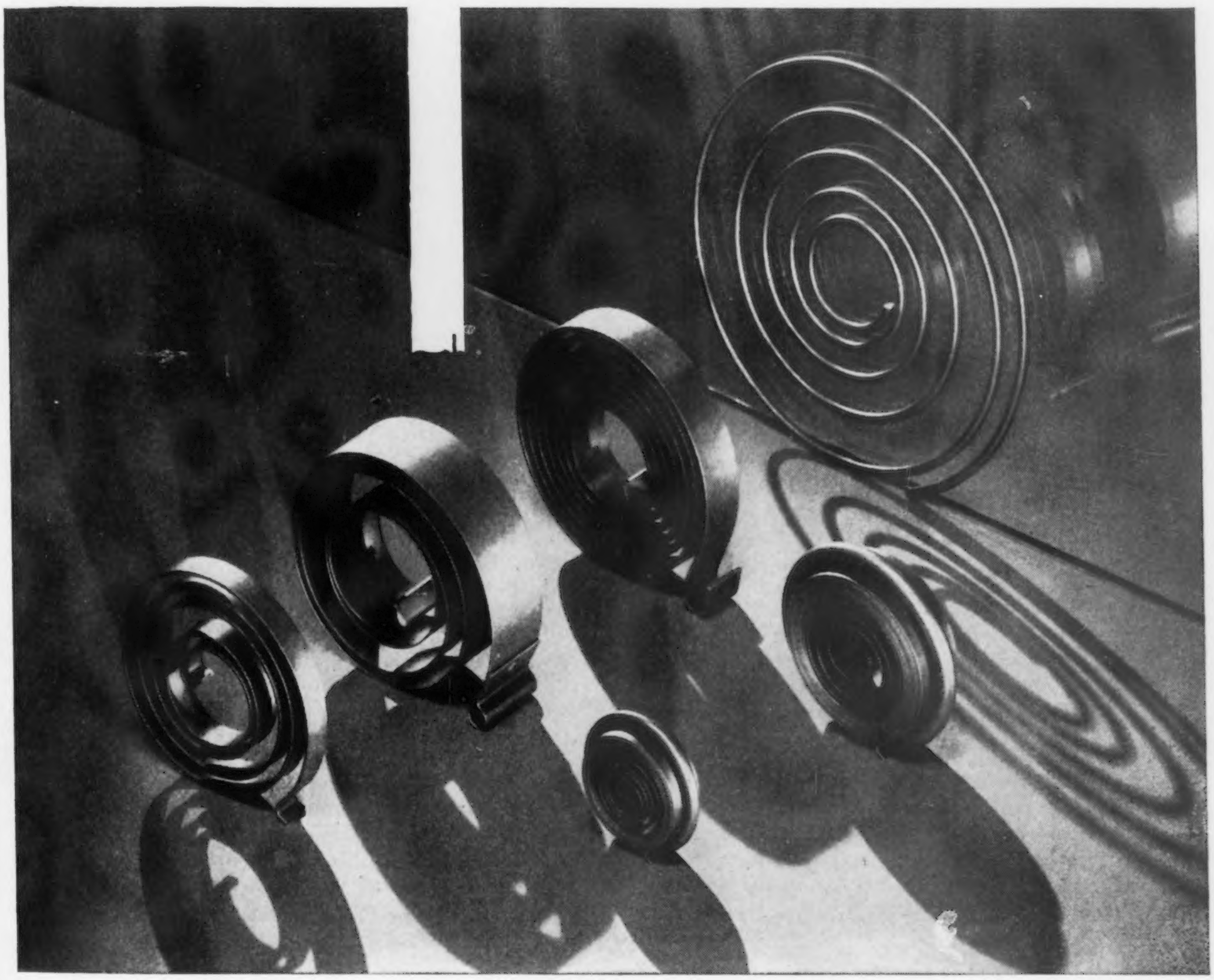

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This Industrial Week . . .

• Consumers Primed for Big Demand

• Labor Seen Main Problem in 1946

• Ingot Output Rises 16.5 Points

IF the steel industry in 1946 does not top its output of about 80,000,000 tons of steel in 1945, it will not be because orders supporting such an operation are not on the books. As the year closed it is estimated that the industry's backlog of unfilled orders ran somewhere between 26 million and 28 million tons of finished products. At the present rate of operations such a backlog would represent close to six month's activity.

The entire metalworking industry, the electrical industry and other large consumers and steel and other metals are facing a showdown this month with the CIO union in its demand for a 30 pct pay increase. In only one major industry—steel—has there been a definite indication that a compromise on the 30 pct increase would be negotiated.

The stumbling block in the steel-wage situation, however, is that the intricate steel problem is inseparably tied in with the wage demand. As the year closed there was nothing in the picture to indicate that the country would not face an industrywide steel strike, the effects of which would be felt within three days to one week by steel consumers.

Practically all steel consumers, anxious concerning their future supply of raw material, have been bombarding the mills with orders and the holiday season represented only a slight drop in the volume of new business. With deliveries extended far into this year and with consumer inventories at or near the vanishing point, it is evident that reconversion in the United States must succeed or fall on the outcome of industrywide labor-management controversies. It is crystal clear that, regardless of government intervention, labor and management are primed for a last ditch showdown with both sides attempting to win public support.

STEEL consumption in 1946 will be limited entirely by the steel industry's ability to produce. Already major steel consuming industries—automotive, construction, railroad, container and oil and gas—have indicated an intention to use every ton of steel obtainable. Their method of preparing for this usage is disclosed by the loading of mill books with orders far beyond the industry's immediate capacity to produce. Limiting factors upon the steel industry are: Probable strikes, disposal of war-built steelmaking facilities and formal retirement of high-cost and obsolete steelmaking equipment.

With these major industries jockeying for prime places on mill order books and with various steel companies attempting to regain their prewar customer relationship, 1946 will see a mad scramble for available steel supplies. At this early date it cannot be foretold which industry will be the most successful in obtaining the greatest share of its requirements. It is probable, however, that the automobile industry, container makers and the oil industry will make fairly good headway because the products which they will demand are not entirely in the lower brackets from the standpoint of profit.

While the iron ore industry, basic supplier of raw materials for steelmaking, was handicapped by a manpower shortage in 1945, THE IRON AGE estimates iron ore shipments for that year at 76,947,000 gross tons. Iron ore consumption by U. S. and ACC Canadian furnaces in 1945 totaled 74,650,000 gross tons, a decline of 12,597,000 tons from 1944. Stocks of ore on hand at U. S. and Canadian furnaces and Lake Erie docks on Dec. 31, 1945, were estimated at 38,500,000 gross tons.

Last year represented a period of very considerable drain upon ore resources, particularly in the Mesabi region. While some observers feel that the iron ore reserve situation is not yet critical, much effort is being directed toward beneficiation of low-grade ores.

A SURVEY of the nonferrous field indicates that American consumers may expect to pay higher prices for lead if government production subsidies under the premium price plan are removed June 30. Domestic high-grade ores are close to exhaustion and imports will become a more important factor despite the tariff.

Offsetting this price prospect is the possibility that world zinc prices may recede over the long term. Foreign copper mines, vastly expanded to meet war demands, must find a market for peacetime surplus or shut down. United States copper mines, however, are fighting a falling production rate and the country for the first time in a peace period may become an importer within the next decade.

Ending of the war has virtually wiped out the largest markets for aluminum and magnesium. In the possibility of developing new uses, particularly for magnesium, lies the sole hope for a substantial operation of surplus plants built to supply war needs.

Steel ingot production this week rebounded to 82 pct of rated capacity, an increase of 16½ points from last week's revised rate of 65.5 pct. Indications are that, because of the extreme shortage of hot metal and scrap, ingot production over the next several weeks will not go much beyond current levels.

Once the steel industry's present labor troubles have been settled, analyses show that steel demand for various producer and consumer products is heavy enough to support a relatively high operating rate in the industry over the next four years. The year 1946, or at least that portion of it which is unaffected by shutdowns, will probably reflect an activity equally as heavy as some of the war-peak periods.

• **ROEBLING'S BUYS AT CHICAGO**—Future plans for the erection of central zone offices and warehouse for John A. Roebling's Sons Co. of Illinois have been disclosed by the purchase of a tract of land at the corner of Roosevelt Rd. and Central Ave., Cicero, from the Chicago Flexible Shaft Co. Purchase price was $100,000.

• **CLASS RATE CHANGE ENJOINED**—A temporary injunction issued Dec. 21 by a Utica, N. Y., federal court prevents the Interstate Commerce Commission from enforcing its orders reducing class railroad rates 10 pct within southern, southwestern and western truck line territories, and a corresponding raise within official territory. (See THE IRON AGE, Aug. 2, 1945, p. 95.) The order throws a snag into the Commission's campaign to realine class freight rates in the South and West with those in effect in the Northeast. If the injunction is made permanent an appeal to the Supreme Court may be expected by the Commission, while if the injunction is removed, northeastern shippers will carry the battle to the higher court. Either way, the rate change may be held up for some time.

• **STUDEBAKER STARTS FULL OUTPUT**—With a clear track ahead on labor matters, Studebaker Corp. started full production Jan. 2, concentrating on its low-price Champion model. The end of the Warner Gear strike at Muncie gave the high-ball to automobile output, which it has delayed for three months.

• **AIRLINE GETS AUXILIARY JET POWER**—An auxiliary exhaust jet to add propulsive thrust will boost the power of the two 2000 hp Pratt & Whitney engines powering 100 new 40 passenger planes purchased from Consolidated Vultee Aircraft Corp. by American Airlines. Hot engine gases pass through an extended exhaust pipe which, by the use of a venturi device, speeds up their flow to give the plane an additional shove, estimated to add 20 mph to the cruising speed.

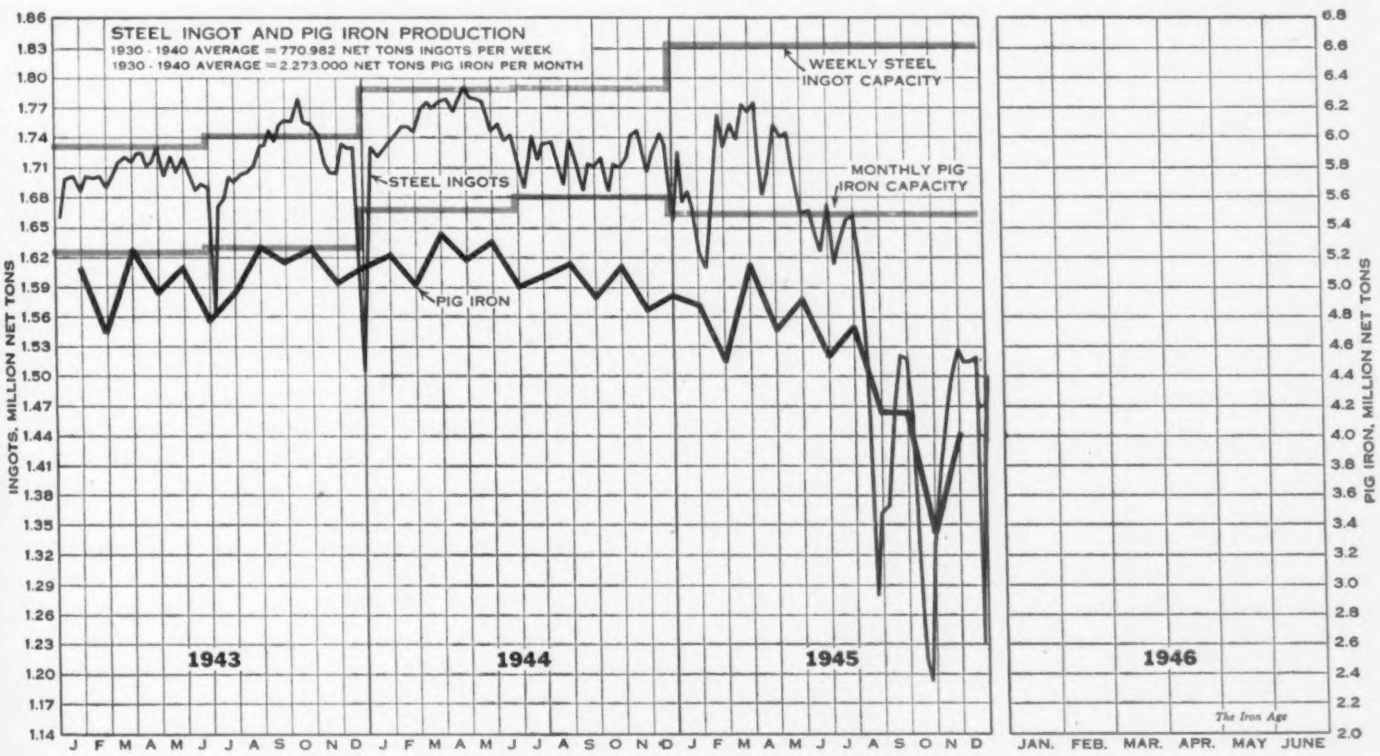
• **PLATINUM IN DEMAND**—Demand for platinum by jewelers far exceeds available stocks depleted by war uses, a report of Baker & Co., Inc., refiner of precious metals, indicates. Canada supplies most of the platinum, palladium, rhodium and ruthenium, all metals in the platinum group. United States production principally from Alaska, slumped during the war although demand was heavy for spark plug electrodes and precision and electronic instruments.

• **KELLY POPS THE PICKETS**—Chicago's Mayor Kelly last week, Dec. 26, gave notice that mass picketing would not be tolerated in Chicago. When city police arrested 30 members of the CIO United Electrical, Radio & Machine Workers picketing the Illinois Gear & Machine Co. plant and dispersed an additional 200, about 100 members set up a picket line in front of the City Hall. That got Kelly's goat and he laid down the law.

• **IRANIAN RAILWAY**—Contract for the construction of a 68 mile addition to the Iranian State Railway system from Kirkuk to Erbil has been placed in the United Kingdom.

• **BACK FROM THE WARS**—An index of reconversion progress is the mid-winter "flyer" of Sears Roebuck & Co. which lists aluminum cookware, carpeting, electric alarm clocks, electric appliances, steel cabinets, metal slat venetian blinds, radios, steel furniture and electrical wire and cable. Indicating that more merchandise is available, this year's book contains 148 more pages in terms of paper used than did last year's.

• **PRODUCTIVITY DOWN IN STEEL**—One of the factors worrying mills today is the high total of manhours per ton of steel produced. Efficiency has slipped off at a terrific rate since the end of the war, with absenteeism being a mounting factor. This boils down to the present labor fight with the CIO-USWA, but it is of grave concern among people in steel managment. How to combat it is a problem for which no one seems to have an answer. Some observers feel that production per manhour will not increase substantially until after the present wage dispute is settled.



Steel Ingot Production by Districts and Pct of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
December 25...	66.0	70.0*	60.0	69.0	74.0	70.5*	69.0	85.0	75.0*	42.0	50.0*	61.0	80.0	65.5
January 1......	77.0	87.5	76.5	80.0	85.5	100.5	80.0	95.0	95.0	54.0	80.0	70.0	98.0	82.0

* Revised

Outlines Permanent Control Plan for German Industry

By DAVE ANSBORO

Washington

• • • **The Foreign Economic** Adm. in its final report detailing a program for the economic and industrial disarmament of Germany, has outlined a long term plan for permanent control of Germany's war-making capacity.

Prepared over a period of a year by a staff of several hundred experts comprising Technical Industrial Disarmament Committees, the report cannot be characterized as an expression of policy or plans by the U.S. Government except as may be covered by the Yalta and Berlin Declarations and announced by the President or Dept. of State. It is also not intended to be an outline of a complete economic program due to the limited mandate given FEA when the study was first undertaken.

A number of the proposals are of highly controversial nature and may be entirely eliminated or modified before being put to practical application.

The five primary measures reflecting the targets fixed by FEA are: (1) The complete and continued elimination of those key industries of unusual war importance; (2) reduction of excess capacities in war-important industries not scheduled for complete elimination; (3) establishment of controls needed to maintain aggregate industrial capacity allowed to continue at a substantially reduced scale; (4) removal of plants rendered useless by application of the proposed program to countries entitled to reparation from Germany and (5) establishment of import and distribution controls over products required for sustained war production or military operations.

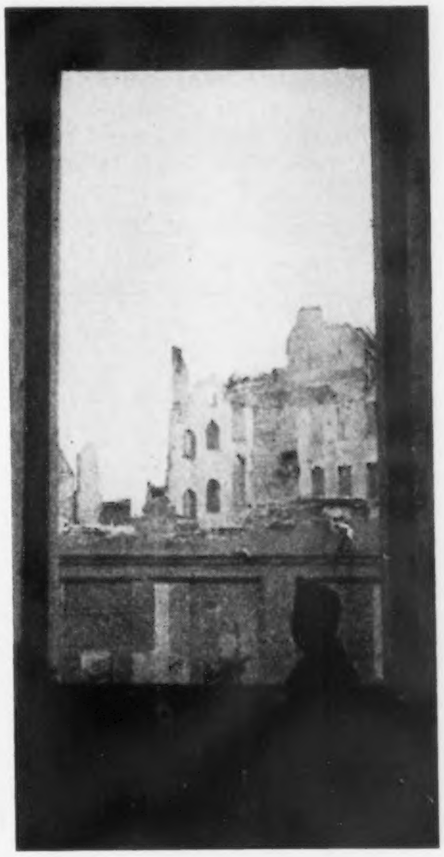
Included among those industries to be prohibited indefinitely, according to FEA recommendations, are light metals (raw aluminum and magnesium), anti-friction bearings and shipbuilding of ocean going vessels.

The specific measures recommended by FEA to reduce excess capacity in heavy industries and to control expansion or rebuilding

° ° °

of industrial facilities are as follows:

Steel: Ingot and casting capacity to be reduced to an amount required to meet the production limitation of 5 million tons per annum, including carbon and alloy steel. It is estimated that annual rated capacity of from 5 million to 6 million tons would be adequate to provide a reserve for shutdowns and changeovers. Within the prescribed production limitation, not more than 600,000 tons of alloy steel is to be produced of which not more than 30,000 tons shall be high alloy. Exports of all steel products are to be prohibited. Peak German steel output during the war is estimated at 21.5 million tons which included substantial quantities of alloy and high alloy steel.



DIFFERENT VIEW: *Looking from Hitler's office presents a far different picture than when he was riding high and mighty. So will the permanent control program look to the Germans as compared with their "Superman" era.*

Pig Iron: Blast furnace capacity to be reduced to an amount required to produce 5 million tons of steel ingots and castings. The estimated 1944 production rate was 16 million tons. Pig iron exports are also to be prohibited.

Iron Ore: Domestic production and imports are to be limited to an amount required for production of 5 million tons steel ingot and castings, less scrap consumed.

Machine tools: Installed stocks of finished machine tools to be reduced from an estimated capacity of 4 million metric tons to 500,000 metric tons. This would leave Germany approximately 240,000 machine tools. New machine tool capacity would be reduced to an amount required for production of 25,000 metric tons of machine tools annually. It is estimated that this would provide about 12,000 new machine tools for replacement purposes. Exports of new machine tools are to be prohibited. The 15 largest metal-cutting tool plants and the 17 largest precision measuring tool plants are to be removed. Exports are prohibited but production limitations are not imposed.

Machinery: Production capacity to be reduced to 1.2 million tons annually compared with 1936 production of approximately 2.5 million tons which figure was expanded to almost astronomical proportions during the war. Exports of machinery would, however, be allowed. The limitations on overall machinery production, plus domestic civilian requirements, constitute an indirect limitation on exports. Exports would moreover be subjected to strict surveillance.

Aluminum Fabrication: Capacity to be reduced to amount required for permitted production estimated at between 40,000 tons and 50,000 tons.

Automotive: German capacity which in 1937 produced 260,000

passenger cars and 62,000 trucks is to be reduced to a level required for production of 90,000 units annually. Exports are to be prohibited. Truck production will be restricted to units weighing 2500 lb or less.

Common Components: Those not directly affected by steel and machine tool production limitations are to be determined by field surveys. Exports are to be prohibited.

Materials which are covered by the long-term imports prohibitions recommended by FEA include alumina and bauxite, except for refractories and chemicals, magnesium and metal other than minimum amounts for improved industrial uses, machinery and machine tools except when manufacture for nonwar industries is not possible in Germany proper.

Materials and products subject to import licensing include bearings, pig iron, ferroalloys, iron ore, chromium, manganese, nickel, tungsten, molybdenum, vanadium and their ores and compounds.

Imports which will be subject to constant surveillance include aluminum ingot, steel ingot and certain specified metals and nonmetallic minerals.

Take Action Against Stainless Producers For License Violation

New York

• • • **Legal action to recover** $5.5 million in the use of patents covering the development and manufacture of stainless steel was initiated in Federal Court here last week.

The plaintiffs, Alwyn B. Wild and Bela J. Klarman, of San Francisco, are described as beneficial owners of rights under the stainless steel patents. The defendents are the American Rolling Mill Co.; Rustless Iron and Steel Corp.; Payson & Co., Inc. of New York City; Clarence E. Tuttle, Alexander L. Feild and Calvin Verity, of Baltimore; William B. Arness, Youngstown, Ohio; Charles R. Hook, Middletown, Ohio; and Ronald Wild, Sussex, England.

The plaintiffs allege they were deprived of the $5.5 million due them after the defendants obtained 1,280,000 common shares of Rustless Iron and Steel Corp. stocks for which the plaintiffs were to receive stainless steel patent rights and the right to use any subsequent developments in stainless steel processes in any part of the world except the United States, Canada and Mexico.

The complaint alleges that in 1924 Alwyn and Ronald Wild owned 32 patents in as many countries for the manufacture of stainless steel, and the two organized the Rustless Iron and Steel Corp. In 1931 the stock transfer was agreed on, and the Wilds also agreed then not to enter the stainless steel business on the North American continent for 20 years.

The plaintiffs state that about the time of the agreement, unbeknown to them, the Alloy Research Laboratories was organized and this organization later developed a number of improvements and sent its employees to Europe to offer the improvements under license, in direct competition with Alwyn Wild, who had bought a steel mill there for $400,000 in which he expected to manufacture stainless steel.

The competition, according to the complaint, almost put Mr. Wild out of business as the Wild patents had only three or four years to run, while the patents on the improvements had twenty years. The competition resulted in the cancellation of numerous license agreements that Mr. Wild had executed concerning the original patents, according to the plaintiffs, and the resultant damages were the consequences.

COMING EVENTS

Jan. 7-11, 1946—SAE Annual Meeting and Engineering Display, Book-Cadillac Hotel, Detroit.

Jan. 21-23—1946 Convention of Institute of Scrap Iron & Steel, Inc., Congress Hotel, Chicago.

Feb. 4-7—National Meeting, American Welding Society, Hotel Cleveland, Cleveland.

Feb. 4-8—National Metal Exposition, Public Auditorium, Cleveland.

Feb. 4-8—National Metal Congress, Public Auditorium, Cleveland.

Feb. 4-8—American Society for Metals, Statler Hotel, Cleveland.

Feb. 4-8—National Meeting, Iron and Steel Institute of Metals Div., American Institute of Mining and Metallurgical Engineers, Statler Hotel, Cleveland.

Feb. 6-8—American Industrial Radium and X-ray Society, Hollenden Hotel, Cleveland.

Feb. 25-28—Annual Meeting, American Institute of Mining and Metallurgical Engineers, Chicago.

Feb. 25-Mar. 1—Spring Meeting, American Society for Testing Materials, Pittsburgh.

Mar. 28-29—American Gas Assn. Conference on Industrial and Commercial Gas, Toledo, Ohio.

Apr. 3-5—SAE National Aeronautical Meeting, Hotel New Yorker, New York.

Apr. 8-12—ASTE Exposition, Cleveland Public Auditorium, Cleveland.

Apr. 11-13—Spring Congress, Electrochemical Society, Inc., Birmingham, Ala.

Apr. 25-26 — Twenty-ninth AIME Annual Open-Hearth Steel and Blast Furnace and Raw Materials Conferences, Chicago.

May 6-10—Foundry Congress and Foundry Show, American Foundrymen's Assn., Cleveland Auditorium, Cleveland.

June 24-28—Forty-ninth Annual Meeting, American Society for Testing Materials, Buffalo.

Appointed AISE Director

Pittsburgh

• • • **T. J. Ess has been appointed** managing director of the Assn. of Iron and Steel Engineers, with headquarters in the Empire Building, Pittsburgh. He succeeds Brent Wiley, who resigned Jan. 1 after holding the position for the past ten years. Mr. Wiley will continue to be identified with the association as an advisory consultant.

T. J. ESS

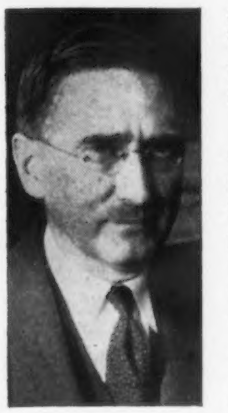
Mr. Ess has been a member of the association staff since 1938, prior to which he spent 15 years with Republic Steel Corp. and its predecessors, Central Steel Co. and Central Alloy Steel Corp. A native of Massillon, O., Mr. Ess graduated from Washington high school there and from Carnegie Institute of Technology.

Steel Industry Strong Factor in Reconversion

By WALTER S. TOWER
*President,
American Iron & Steel Institute*

New York

• • • **The state of affairs** in a broad basic industry like iron and steel warrants more than casual public interest at this juncture as the nation strives to get back to a sound peacetime footing.



W. S. TOWER

The industry's ample steel capacity of close to 95 million tons per year provides the nation with one very reassuring actuality. This capacity is more than adequate to meet immediate peacetime demands for steel—demands which are expected to be heavy.

It seems improbable that in the immediate future civilian demands will cause steel production to exceed the all-time record of close to 90 million tons which was made in 1944. But production may very well exceed the previous peacetime peak of 63,206,000 net tons made in 1929. Steel is still the cheapest, most abundant and most versatile of all metals. Its quality and usefulness are constantly being improved. Its industrial applications are wider than ever.

In 1945 production of ingots and steel for castings was between 79,000,000 and 80,000,000 net tons, a decline of about 10,000,000 tons or 11 pct from the 89,641,600 tons which constituted a record in 1944. Steel mills operated at an average of about 83.8 pct of capacity through 1945, compared with 95.5 pct of capacity in 1944. After the industry had speedily solved its reconversion problems last autumn, output exceeded expectations both before and after the coal strike.

Production of pig iron and ferroalloys in 1945 is estimated to total about 53,000,000 net tons, against 62,072,683 tons in 1944.

The steel industry's average employment in 1945 in the production and sale of iron and steel products was 548,000 persons, compared with average employment of 571,200 in 1944. In the autumn of 1945 the industry had many jobs which it was anxious to fill, a total estimated at 55,500 vacancies when one spot survey was made by the American Iron and Steel Institute.

Total payrolls of the steel industry in 1945 are estimated at $1,631,000,000, to persons directly engaged in the production and sale of iron and steel products. That figure compares with $1,745,019,700 paid in payrolls in 1944. The shrinkage in payrolls in 1945 as compared to 1944 was relatively less than the shrinkage in steel output.

Rust Surveys Ordnance Plants for Disposal

Pittsburgh

• • • **Contracts for surveys** of disposal possibilities of four major ordnance plants, aggregating about $60,000,000 in value, have been awarded by the Reconstruction Finance Corp., to Rust Engineering Co., Pittsburgh.

Plants embraced by the surveys are the Meadville, Pa., TNT plant; Titusville, Pa., 8-in. shell plant; Williamsport, Pa., airplane engine plant; and the Gadsen, Ala., shell plant. These properties, owned by the government and operated by private companies as lessees, have all been declared surplus.

Rust will make an engineering study of these plants with the purpose of recommending to RFC how they may be disposed of so as to realize the greatest yield to the government.

Possibilities to be considered include whether the plants should be put up for sale as they stand, dismantled and sold as a unit or in parts, or scrapped and sold. Also, there is the question of whether or not the machinery should be sold separately from the plant.

The most costly of the four named properties is the Meadville plant, known as the Keystone Ordnance Works. This was reported to have cost about $50,000,000 to erect and was one of the chief plants of its type in the Pittsburgh Ordnance District.

Blaw-Knox Gets License For Zanderoll Process

Pittsburgh

• • • **A radical departure** in the method of applying insulating varnish to armatures, to stators, and similar types of electrical apparatus was indicated in the announcement that the Blaw-Knox Co. of Pittsburgh had acquired the manufacturing rights of an unusual process known as the Zanderoll process.

It has been stated that the speed of the process eliminates numerous steps and much of the manual handling found in conventional varnish application procedure. Excellent penetration and coverage, plus application so uniform that balancing may be done before treatment by this process, in addition to the very substantial speed-up in the time needed for application, promises to revolutionize methods now in use.

National Radiator Co. Erects New Mold Shop

Johnstown, Pa.

• • • **To meet growing** demands for industrial castings and heating equipment, the National Radiator Co., has started construction of an extensive addition to its plant at New Castle, Pa., it has been announced by Robert S. Waters, president of the firm.

Facilities for another mechanical molding unit that will augment present equipment and substantially increase production of castings for industrial use and for heating systems will be provided in the new building, Mr. Waters said.

E. L. Brundage, superintendent of the New Castle plant, states that jobs for an additional 200 employees will be made available by the expansion. Production in the new addition is expected to begin by Mar. 1.

National Radiator Co. engineers, in collaboration with the Rust Engineering Co., Pittsburgh, designed the new addition which will cost more than $235,000, including equipment. Of brick and steel construction, the building will add about 11,000 sq ft of flood space to existing facilities at New Castle. Matthew Leivo & Son, New Castle general contractors, are the builders.

MACHINE TOOLS

. . . News and Market Activities

SPA Tool Sales by Dealers Showing Up

Chicago

• • • **Some sales of** surplus machine tools in government warehouses already have been consummated by dealers licensed to participate in the Reconstruction Finance Corp. disposal program here.

License applications of approximately 40 new and used machinery distributors and dealers have been processed at the local RFC office. Most of these applications have come from used machinery dealers whose status has been established.

Distributors and dealers of new tools indicate that they are planning to participate in the program to a varying degree. The incentive offered to these outlets is less than in their usual line of business because of the lower selling price of surplus used tools which affords a lower net return per unit sold. However, with delayed deliveries quoted on many new tools, the surplus program affords the new distributors and dealers an opportunity to fill out the requirements of large-scale buyers tooling up for a complete production program. Some distributors are planning to handle only government surplus tools of the particular types and makes which they represent. In the case of limited purpose tools particularly, engineering facilities of the distributors allows them to place tools more readily than government sales agents and used machinery dealers without engineering services at their command.

The used machinery dealers generally, view the program enthusiastically and welcome the opportunity to participate in surplus disposal rather than having to compete against it.

"Our members are entering the program wholeheartedly on a fair-minded basis," declares Randolph K. Vinson, executive director of the Machinery Dealers National Assn., "and we expect full cooperation from the local RFC sales agencies. The dealers are able to offer a real service to their customers in locating tools held for disposal by RFC sales agencies throughout the country, and can sell these tools at no greater cost to the customer than if he dealt with RFC directly."

Local chapters of the Machinery Dealers National Assn. have held meetings with RFC officials at New York, Chicago and Philadelphia, and are scheduling meetings for Detroit, Cleveland and New England. Col. John S. Cooke, deputy director of the RFC previously met with the association board of directors to discuss specific questions concerning the program.

Dealers are carefully watching the attitude of RFC on sales directly from war plants, which were scheduled to start Jan. 1. The cream of the tools is believed to be involved in these sales from plants, rather than tools now located in government warehouses which in many cases are limited purpose machines. Free access to plants is held essential to the success of the program by dealers who feel that if they were discouraged from making other than warehouse sales profitable participation would be limited. Although licensing of dealers is progressing rapidly, it is felt in the trade that the program will not gain full force until mid-year because of delays in making surplus available and instructing both RFC and dealer personnel in the intricacies of the program.

Some dealers regard the priority provisions of the Surplus Property Act as a barrier to rapid disposal of surplus and propose to feel their way in functioning under the program.

Dealer Enlistments To SPA's Plan Very Good

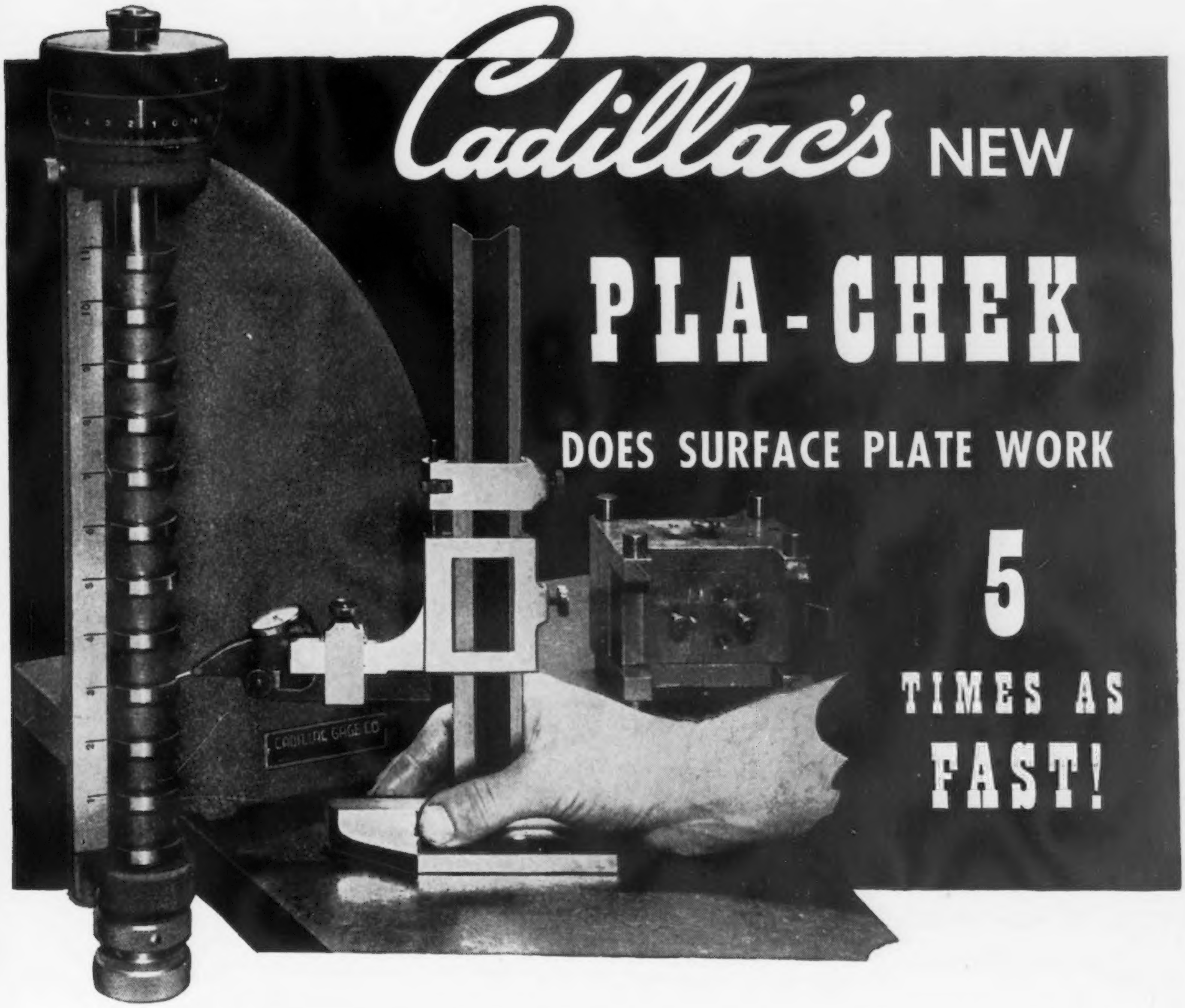
Cleveland

• • • **If the number of** dealers filing applications with Reconstruction Finance Corp. disposing loan agencies can be taken as an indication of normal trade channel interest in surplus machine tool disposal, the Surplus Property Administration's new plan to use the dealers, covered by Regulation 255, is earmarked for success.

RFC officials in charge of dealer enlistment in this area have classed the response shown so far as "very good" and point to some 75 applications preponderantly from used machinery dealers, but with a fair spread of the new machinery merchandisers and presumably a few manufacturers.

Dealers themselves, especially those who have always done a good deal of missionary work as a part of their normal operation, are signing up as much in self defense as for any other reason, and while this could conceivably cover a multitude of other reasons, the bigger dealers certainly wouldn't want too much of this missionary work upset without a chance to talk about things, and if they stay away from SPA's program, quite naturally they would not be included in many things. Along this same line, it has been reported here that veterans are showing considerable interest in the machine tool business.

Generally, dealers report the presence of some business, naturally not as much as they would like, but at least enough money and machines are changing hands to convince them that all business has not, as yet, crawled into a hole. Sales are, according to sources in the trade, not sizable, but in volume comparable to that of the last two or three months, and many dealers attribute current market conditions to the labor uncertainty which is certainly one of the real problems of the moment.



WITH Cadillac's new Pla-Chek you can get out five times as much surface plate inspection work as you do now—and it will be accurate because Pla-Chek is guaranteed accurate to .00005″.

Pla-Chek is a hardened steel bar with 12 steps spaced exactly 1″ apart; a micrometer screw thread ground on the lower end; a large micrometer thimble graduated in .0001″ on the upper end of the bar and a simple triangular-shaped support bracket.

With this bracket set on a conventional surface plate and the micrometer thimble set at zero, the lower end of the bar is exactly level with the surface plate.

The micrometer is then set for the desired dimension in thousandths and tenths of thousandths and the measurement is taken from the desired inch step. Measurements are guaranteed accurate to .00005″ for any size from .001″ to 12″ from the surface of the plate.

TWO WEEKS FREE TRIAL

So that your inspectors can see how much time Pla-Chek will save them, we will send it on two weeks free trial. If this trial satisfies you, send your check, if not, return Pla-Chek express collect and you owe us nothing.

Cadillac GAGE COMPANY

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NONFERROUS METALS

. . . News and Market Activities

Mission Inspects 40 Pacific Tin Dredges

Washington

• • • **In its preliminary** report, the U. S. Tin Mission agrees with estimates of mining companies that production of tin in British Malaya in 1946 will be only a fraction of normal but thereafter will improve rapidly, reaching close to the prewar figure in 1948. Damage by the Japanese to the tin dredges was found to be much less than expected.

According to RFC, stocks of tin amounting to some 4500 tons have so far been located in Malaya and much the same quantity in Siam. The disposition of this metal is being considered by the Tin Committee of the Combined Resources Materials Board sitting in Washington. It is also known, RFC said, that there are certain stocks of concentrates in those countries, but no reliable estimate could be obtained regarding their amount at the time of the Mission's visit.

The Mission, representing the U. S. Commercial Co., RFC subsidiary, included Arthur Notman and Charles Slaughter, who spent several weeks in Malaya where they saw government and military officials and inspected some 40 dredges. According to the Mission there was no evidence of any systematic effort by the Japs to wreck them or render them useless, though most dredges are temporarily out of operation due to petty thievery of essential parts. The most serious obstacles to renewed production, the Mission reported, are the poor condition of dredges because of operation by the Japs without normal repairs or replacements, the poor location of many dredges by reason of unscientific dredging operations and unsettled economic conditions in the country. Some of these conditions were said to be the natural result of Japanese military occupation, but they are complicated by shortage of motor vehicles and shortages of food and consumer goods for the workers. On the favorable side, it was said, the dredging companies see no difficulty in rerouting such labor if food can be obtained. Shipping was said to be adequate and tin smelters were found to be in good condition.

These findings bear out the judgment of the Tin, Lead and Zinc Div. several months ago that it would be several years before the eastern tin-producing areas reached their normal production potential. In the meantime there is the windfall represented in the findings of refined tin and concentrates.

•

Develops Molybdenum New Forming Process

Pittsburgh

• • • **The production of molybdenum** in large pieces and in a multiplicity of shapes has been announced by Westinghouse at the company's Bloomfield, N. J., plant devoted to the manufacture of lamps and electronic tubes.

Molybdenum melts as 4748° F and, although pure molybdenum in powder form can readily be prepared from its natural oxide, it cannot be melted like other metals to form large solid pieces because the container or crucible would melt first. Thus molybdenum pieces have been made by compacting the powder into the desired shape under great pressure and passing a high current through to bring its temperature up just below the melting point so that the particles adhere to each other. This method has obvious limitations, both as to sizes and shapes.

Westinghouse has made advances in a new process that removes restrictions on size and shape. The piece can have any shape that can be molded. It can also have fins, angles, and holes, and much larger overall dimensions than heretofore possible.

Molybdenum is now used in the form of crucibles, electronic tube parts, electrical contacts, electrodes for resistance heating of glass welding tips, thermocouple tubes, and electric furnace heating elements for high temperature work in a vacuum or protective atmosphere. It is expected to be useful for welding alloys and high temperature engine parts.

Lead Price Increase Is Suggested in Shortage

New York

• • • **CPA's Tin, Lead and Zinc** Div. has allotted only 20,000 tons of lead to consumers in January which reflects continued tightness in lead based on lowered import tonnage, inadequate domestic production and increasing civilian and foreign demand. Imports coming from Mexico, Peru and Australia are expected to total 13,000 tons in January which represents a drop from the recent monthly average of 20,000 tons.

Some consumers are being required to take the corroding grade of lead, at a premium price, when their needs could be met by the common grade. This is made necessary because available supplies do not correspond fully, by grade, with requirements.

Officials have not commented recently on the premium price plan, which will not end until the middle of the year. However, in the case of lead, there is some thought in the industry that a solution to the problem of shortage would be to increase ceiling prices to encourage additional production.

•

Tin Mill Products Change

Pittsburgh

• • • **Tin Mill Products** Corp has changed its name, effective Jan. 1, to Fort Duquesne Steel Co., it was announced by Donald C. Lott, president. Mr. Lott said the change was made because the former name no longer correctly described the activities of the company.

The company is now removing its warehouse facilities and general offices to a newly constructed plant, a move that will be completed about Feb. 1.

The new warehouse will be equipped with complete shearing and slitting facilities and will enable the company to carry a larger and more complete line of flat-rolled steel.

HOLTITE
"TAP" Screws
The NEW
screw that actually TAPS
its own perfect mating threads
Where other self-tapping screws forcibly displace the material by a cold forging action, this remarkable new screw (fundamentally a narrow fluted two-flute tap) actually *cuts* its own perfect mating threads in *any* material to effect tighter, stronger, more enduring fastenings. In action, the curled chips *cut* from material are pushed ahead of the screw in same manner as chips are pushed ahead of a spiral pointed tap. Metal and non-metallic cuttings free themselves readily, thus eliminating binding, and reducing driving torque and effort.
U.S.Pat. No. 2,292,195
Other Patents Pending
This slot, corresponding to the flutes of a tap, provides two balanced cutting edges and a reservoir for easier chip clearance.
Cutting edges of slot perform actual tapping operation
Ideal for plastics and cast iron, these "TAP" Screws eliminate need for tapping any material, and can be used in holes much deeper than their own diameter. The pilot point permits "TAP" Screw to start straight in hole to prevent breakage.
Save Tapping Costs When Fastening Any Kind Of Material
CONTINENTAL SCREW CO.
New Bedford, Mass., U.S.A.

Primary Metals

(Cents per lb, unless otherwise noted)

Aluminum, 99+%, del'd (Min. 10,000 lb)	15.00
Aluminum pig	14.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Cadmium, del'd	90.00
Cobalt, 97-99% (per lb)	$1.50 to $1.57
Copper, electro, Conn. valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.8%, dollars per troy oz.	$ 2.25
Iridium, dollars per troy oz.	$90-$100
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9 + %, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb flask, f.ob. New York	$109 to $112
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, New York, cents per oz.	71.11
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.65

Remelted Metals

(Cents per lb)

Aluminum, No. 12 Fdy. (No. 2)	9.00 to 10.00
Aluminum, deoxidizing No. 2, 3, 4	7.25 to 10.00
Brass Ingot	
85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....		19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c.

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals; ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NONFERROUS SCRAP METAL QUOTATIONS

†(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.00
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.00
Automobile radiators	7.25
Zincy bronze borings	7.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.00
Brass pipe	7.25
Old rolled brass	6.75
Admiralty condenser tubes	7.25
Muntz metal condenser tubes	6.75
Plated brass sheet, pipe reflectors	6.25
Manganese bronze solids	7.00[1]
Manganese bronze solids	6.00[2]
Manganese bronze borings	6.25[1]

OPA Group 4†

Refinery brass	4.50*

*Price varies with analysis, [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum*

Plant scrap, segregated

2S solids	8.00
Dural alloys, solids 14, 17, 18, 24S 25S	4.00
turnings, dry basis	3.00
Low copper alloys 51, 52, 61, 63S solids	7.25
turnings, dry basis	5.75

Plant scrap, mixed

Solids	4.00
Turnings, dry basis	2.75

Obsolete scrap

Pure cable	8.00
Old sheet and utensils	6.00
Old castings and forgings	5.00
Pistons, free of struts	5.00
Pistons, with struts	3.00
Old alloy sheet	5.00

Magnesium*

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	1.50

Mixed, contaminated plant scrap

Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

*Nominal.

Zinc

New zinc clippings, trimmings	6.50
Engravers, lithographers plates	6.50
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead including cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 23¢ per lb.; 90 to 98% Ni, 23¢ per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

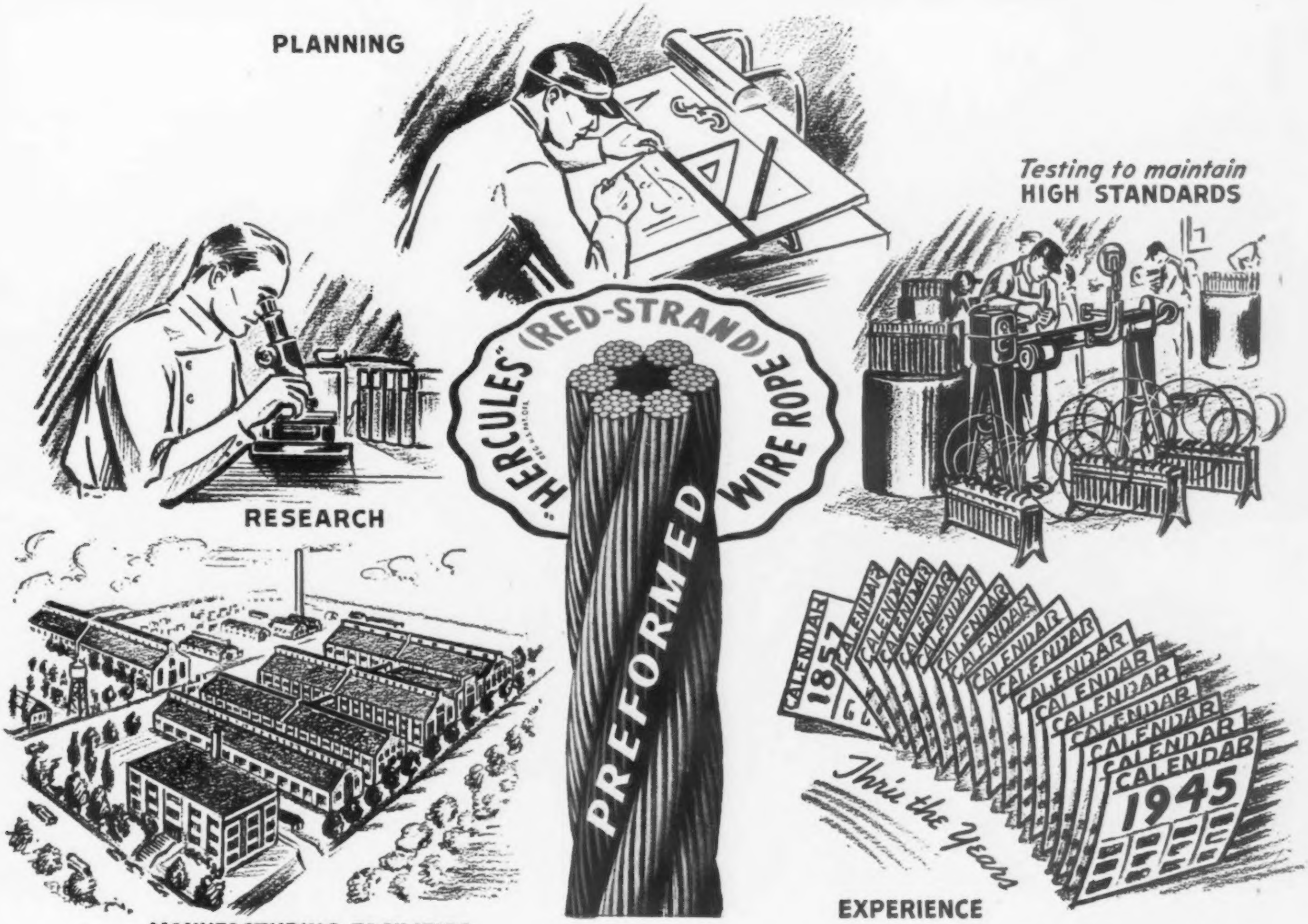
(Cents per lb., f.o.b. shipping point in 500 lb. lots)

Copper, frt. allowed	
Cast, oval, 15 in. or longer	25⅛
Electrodeposited	18⅞
Rolled, oval, straight	19⅛
Curved	20⅝
Brass, 80-20, frt. allowed	
Cast, oval, 15 in. or longer	23⅝
Zinc, cast, 99.99, 15 in. or longer	16¼
Nickel, 99 per cent plus, frt. allowed	
Cast	47
Rolled, depolarized	48
Silver, 999 fine	
Rolled, 100 oz. lots, per oz.	80

Chemicals

(Cents per lb., f.o.b. shipping point)

Copper cyanide, 1-5 bbls.	34.00
Copper sulphate, 99.5, crystals, bbls.	7.75
Nickel salts, single, 425 lb. bbls., frt. allowed	13.50
Silver Cyanide, 100 oz. lots, per oz.	0.6083
Sodium cyanide, 96 per cent, domestic, 100 lb. drums	15.00
Zinc cyanide, 100 lb. drums	33.00
Zinc sulphate, 89 per cent, crystals, bbls., frt. allowed	6.35



Factors that determine its QUALITY

The quality of "HERCULES" (Red-Strand) Wire Rope is never a matter of chance . . . it is the result of careful planning, diligent research, long experience, advance manufacturing facilities . . . *plus* high standards and the determination to maintain them.

As it is difficult to point out which is the most important leg of a three-legged stool, so it is hard to say which of these factors is the most vital . . . we know from experience that *all* are necessary. Proof of wire rope quality is in performance . . . find out for yourself just what "HERCULES" can do on your own job. Many who have made this test are now regular users.

Yes, there is a correct construction and type of "HERCULES" (Red-Strand) Wire Rope to fit any job . . . anywhere.

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PORTLAND 9 . . 914 N. W. 14th Avenue
SEATTLE 4 . . . 3410 First Avenue South

SCRAP

. . . News and Market Activities

Holiday Absenteeism Hits Scrap Flow

New York

• • • An **already tight** scrap market has been further tightened by inclement weather and by the holiday-season influences. This has been carried to an extreme in St. Louis where a large dealer was forced to suspend operations for several days because no yard laborers reported for work.

Although scrap movement has dropped off, demand continues strong. Prices remain firm at ceiling, in general, with no price changes reported during the past week.

Hopes of Chicago dealers for obtaining scrap from the West Coast have fallen, due to a postponement of the freight rate drop. Scrap inventories are very low throughout the country, with an impending steel strike on deck. The scrap industry awaits with apprehension the outcome of the strike—if it materializes—as to whether supplies will be abundant due to the subsequent drop in demand or whether supplies will be further depleted due to the production of scrap being retarded.

•

Chicago

• • • **Suspension for seven** months by the Interstate Commerce Commission of the special freight rate of $12.32 per gross ton on structural steel and plate scrap moving from the West Coast to Chicago has put a damper on plans of local mills to move shipyard termination scrap here.

A tooth and nail fight by West Coast mills to prevent draining that area of shipyard termination scrap led to the suspension of the special rate by the Commission just before the effective date of Dec. 22. Meanwhile, movement already had started at the old rate of $14.82 per gross ton of 10,000 tons of shipyard scrap purchased on the coast by Carnegie Illinois Steel Corp.

The local mills had counted heavily upon the West Coast material to prevent further shutting down of steelmaking facilities due to lack of scrap. Carnegie Illinois already has been forced to cut its scheduled operations 11 pct because of scrap shortage. With continued cold weather, and scrap movement severely cut during the holiday season, further operating cuts in the district appear probable.

Interests protesting the lower rate indicated to the Commission that the amount of scrap on the West Coast, reported locally at around 150,000 tons, had not been fully determined and probably was exaggerated. The seven month waiting period is the regular statuatory period. An examiner will be assigned to conduct hearings regarding the proposed rate.

•

PITTSBURGH—The scrap supply here is tighter than ever, with bad weather practically stopping all yard movement, and strikes stopping all production scrap of any consequence. Observers feel that the situation is worse than during the war if for no other reason than the fact that the war shortages always found some scrap moving, but present conditions not only have caused shortages of scrap but the total movement is very low. Ordnance and surplus scrap is coming in but much of it has to be prepared in yards where operations are slow because of the cold weather and the holidays. Further, much of this scrap is triple alloy material that is not as acceptable to the mills as the straight carbon scrap and scrap of definitely known alloy content.

•

CHICAGO—Shipments to mills have been greatly restricted under the combined impact of cold weather and the holiday season, forcing further withdrawals upon already depleted inventories. Improvement in yard activity is expected with the passing of the cold spell and with strong pressure from buyers. A gradual, but increasing, flow of reconversion scrap should begin to emanate from stepped-up manufacturing activities, barring a steel strike, within the next few weeks.

•

BUFFALO—Leading scrap consumers dug heavily into stockpiles during the big blizzard despite reduced rail embargo. This was followed by a modest wave of buying in this market. Orders for over 10,000 tons of openhearth grades were placed at the maximum price within a short period. Bids were closed Friday on 2500 tons of surplus scrap at the local plant of American Car and Foundry. This is one of the largest offerings to be made here so far by the government.

PHILADELPHIA—Similar to trends in other districts scrap supplies continue tight. The new year will not find conditions any better. While some observers feel that a steel strike would result in better scrap supplies because of mills being down this will not necessarily be true.

•

DETROIT—Demand for scrap continues to mount in this area, with both local and outside mills intensively in the market. During the year end shipments were at very low levels, and immediate prospects for fulfilling furnace requirements were none too good.

•

NEW YORK—Scrap movement in this area has dropped to a very low point, due primarily to the holiday season letup, in spite of the fact that demand continues very strong. Prices continue firm at ceiling, with no changes reported during the past week. The Army 2nd Service Command reports that no landing mat scrap sales of any quantity are forthcoming in the near future, further tightening the situation.

•

CLEVELAND—With shipments down to a trickle, the scrap market here is as tight as anyone has seen it in recent years. Production has fallen off to practically nothing, and prices on unprepared material, principally termination inventory, are traveling upward. In the varying, and in some cases the trifling tonnages that are available, all grades are moving, and at ceiling prices. Termination inventory has become one of the main scrap sources. Observers in the trade report that some mills are even buying the higher nickel grades from terminations with an eye to the future when such may not be available.

•

ST. LOUIS—Demand strong, supply low, prices firm is the scrap iron story in the St. Louis industrial section. Weather and the shortage of labor retarded the movement last week, and this week the holidays added to the problem. One large dealer was unable to operate for four days last week because no laborers reported. Mills are cutting into their piles. Prices are unchanged.

•

BIRMINGHAM—Heavy demand on a prompt delivery basis continues to exist in this market for both openhearth and blast furnace grades. Mill inventories are adequate, but not long. Interest in electric furnace and foundry grades has increased slightly. Prices are unchanged, with all material being sold at ceiling.

•

TORONTO—General stagnation gripped the Canadian scrap markets for the past week and while dealers look for some betterment for the early part of 1946 the outlook for ample scrap supply is far from bright. During the past week scrap deliveries to dealers' yards and consuming plants showed further sharp decline and it is stated that shipments were less than 10 pct of actual requirements.

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages. Where asterisks are used on quotations below, this indicates a ceiling price to which must be added brokerage fee and adjusted freight.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
RR. hvy. melting	21.00*
No. 2 hvy. melting	20.00*
RR. scrap rails	21.50*
Rails 3 ft. and under	23.50*
No. 1 comp'd sheets	20.00*
Hand bdld. new shts	20.00*
Hvy. axle turn.	19.50*
Hvy. steel forge turn	19.50*
Mach. shop turn.	15.00*
Short shov. turn.	17.00*
Mixed bor. and turn	15.00*
Cast iron borings	16.00*
Hvy. break cast	16.50*
No. 1 cupola	20.00*
RR. knuck. and coup	24.50*
RR. coil springs	24.50*
Rail leaf springs	24.50*
Rolled steel wheels	24.50*
Low phos. bil. crops	25.00*
Low phos.	22.50*
RR. malleable	22.00*

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 1 bundles	18.75*
No. 2 dealers' bndls	18.75*
Bundled mach. shop turn.	18.75*
Galv. bundles	16.75*
Mach. shop turn.	13.75*
Short shovels, turn.	15.75*
Cast iron borings	14.75*
Mix. borings & turn.	13.75*
Low phos. hvy. forge	23.75*
Low phos. plates	21.25*
No. 1 RR. hvy. melt	19.75*
Reroll rails	22.25*
Miscellaneous rails	20.25*
Rails 3 ft. and under	22.25*
Locomotive tires, cut	$23.75 to 24.25
Cut bolsters & side frames	21.75 to 22.25
Angles & splice bars	22.25*
Standard stl. car axles	24.25 to 24.75
No. 3 steel wheels	23.25*
Couplers & knuckles	23.25*
Agricul. malleable	22.00*
RR. malleable	22.00*
No. 1 mach. cast.	20.00*
No. 1 agricul. cast.	20.00*
Hvy. breakable cast.	16.50*
RR. grate bars	15.25*
Cast iron brake shoes	15.25*
Stove plate	19.00*
Clean auto cast.	20.00*
Cast iron carwheels	20.00*

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
No. 1 bundles	19.50*
No. 2 bundles	19.50*
Mach. shop turn.	$10.50 to 11.00
Shoveling turn.	12.50 to 13.00
Cast iron borings	11.50 to 12.00
Mixed bor. & turn	11.50 to 12.00
Low phos. plate	22.00*
No. 1 cupola cast.	20.00*
Hvy. breakable cast.	16.50*
Stove plate	19.00*
Scrap rails	21.00*

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$15.05*
No. 2 hvy. melting	15.05*
No. 1 and 2 bundles	15.05*
Busheling	15.05*
Turnings, shovelings	12.05*
Machine shop turn.	10.05*
Mixed bor. & turn.	10.05*
Cl'n cast, chem. bor	$13.06 to 14.15*

Truck delivery to foundry

Machinery cast.	21.00 to 23.51*
Breakable cast	21.57 to 21.87*
Stove plate	20.00 to 23.51*

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$17.32*
No. 2 hvy. melting	17.32*
No. 1 bundles	17.32*
New busheling	17.32*
Flashings	17.32*
Mach. shop turn.	12.32*
Short shov. turn.	14.32*
Cast iron borings	13.32*
Mixed bor. & turn.	12.32*
Low phos. plate	19.82*
No. 1 cupola cast	20.00*
Charging box cast.	19.00*
Hvy. breakable cast	16.50*
Stove plate	19.00*
Automotive cast	20.00*

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 2 bundles	18.75*
Mach. shop turn.	13.75*
Shoveling turn.	15.75*
Cast iron borings	$13.50 to 14.00
Mixed bor. & turn.	13.75*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Cast, charging box	19.00*
Hvy. axle forge turn	18.25*
Low phos. plate	21.25*
Low phos. punchings	21.25*
Billet crops	21.25*
RR. steel wheels	23.25*
RR. coil springs	23.25*
RR. malleable	22.00*

ST. LOUIS

Per gross ton delivered to consumer:

Heavy melting	$17.50*
Bundled sheets	17.50*
Mach. shop turn.	12.50*
Locomotive tires, uncut	$18.50 to 19.00
Misc. std. sec. rails	19.00*
Rerolling rails	21.00*
Steel angle bars	21.00*
Rails 3 ft. and under	21.50*
RR. springs	22.00*
Steel car axles	24.50*
Stove plate	19.00*
Grate bars	15.25*
Brake shoes	15.25*
RR. malleable	22.00*
Cast iron carwheels	20.00*
No. 1 mach'ery cast	20.00*
Breakable cast	16.50*

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.00*
No. 2 hvy. melting	17.00*
No. 2 bundles	17.00*
No. 1 busheling	17.00*
Long turnings	12.00*
Shoveling turnings	14.00*
Cast iron borings	13.00*
Bar crops and plate	$18.50 to 19.50*
Structural and plate	18.50 to 19.50*
No. 1 cast	20.00*
Stove plate	19.00*
Steel axles	18.50*
Scrap rails	18.50
Rerolling rails	20.50*
Angles & splice bars	20.50 to 21.00
Rails 3 ft. & under	21.00*
Cast iron carwheels	17.50 to 18.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
No. 2 hvy. melting	20.00*
Low phos. plate	22.50*
No. 1 busheling	20.00*
Hydraulic bundles	20.00*
Mach. shop turn.	15.00*
Short shovel. turn.	17.00*
Cast iron borings	16.00*

NEW YORK

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$15.33*
No. 2 hvy. melting	15.33*
Comp. black bundles	15.33*
Comp. galv. bundles	13.33*
Mach. shop turn.	10.33*
Mixed bor. & turn.	10.33*
Shoveling turn.	12.33*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Charging box cast	19.00*
Store plate	19.00*
Clean auto cast	20.00*
Unstrip. motor blks	17.50*
Cl'n chem. cast bor	14.33*

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.25*
No. 1 bundles	19.25*
No. 2 bundles	19.25*
No. 2 hvy. melting	19.25*
Mach. shop turn.	14.25*
Shoveling turn.	16.25*
Cast iron borings	14.25*
Cast iron borings	15.25*
Mixed bor. & turn.	14.25*
Stove plate	19.00*
Low phos, plate	21.75*
Scrap rails	20.75*
Rails 3 ft. & under	22.75*
RR. steel wheels	23.75*
Cast iron car wheels	20.00*
RR. coil & leaf spgs	23.75*
RR. knuckles & coup	23.75*
RR. malleable	22.00*
No. 1 busheling	19.25*

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
Compressed sheet stl.	19.50*
Drop forge flashings	19.00
No. 2 bundles	19.50*
Mach. shop turn.	14.50*
Short shovel.	16.50*
No. 1 busheling	19.50*
Steel axle turn.	19.00*
Low phos. billet and bloom crops	24.50*
Cast iron borings	15.50*
Mixed bor. & turn.	14.50*
No. 2 busheling	17.00*
No. 1 machine cast	20.00*
Railroad cast	20.00*
Railroad grate bars	15.25*
Stove plate	19.00*
RR. hvy. melting	20.50*
Rails 3 ft. & under	23.00*
Rails 18 in. & under	24.25*
Rails for rerolling	23.00*
Railroad malleable	22.00*
Elec. furnace punch	22.00*

SAN FRANCISCO

Per gross ton delivered to consumer:

RR. hvy. melting	$15.00 to 15.75
No. 1 hvy. melting	15.00 to 15.75
No. 2 hvy. melting	14.00 to 14.75
No. 2 bales	12.50 to 13.25
No. 3 bales	8.50 to 9.25
Mach. shop turn.	7.00
Elec. furn. 1 ft. und	15.50 to 17.00
No. 1 cupola cast	19.00 to 21.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$12.00 to $13.00
No. 2 hvy. melting	11.00 to 12.00
No. 2 bales	10.00 to 11.00
No. 3 bales	9.00 to 10.00
Mach. shop turn.	4.50
No. 1 cupola cast	19.00 to 21.00

SEATTLE

Per gross ton delivered to consumer:

RR. hvy. melting	$10.00
No. 1 & No. 2 hvy. melting	10.00
Elec. furn. 1 ft. und	$14.00 to 15.00
No. 1 cupola cast	20.00*

HAMILTON, ONT.

Per gross ton delivered to consumer:

Heavy melting	$17.50*
No. 1 bundles	17.50*
No. 2 bundles	17.00*
Mixed steel scrap	15.50*
Rails, remelting	18.50*
Rails, rerolling	21.50*
Bushelings	13.00*
Mixed borings & turnings	12.50*
Electric furnace bundles	20.50*
Manganese steel scrap	20.00*
No. 1 cast	19.00*
Stove plate	17.50*
Car wheels, cast	19.50*
Malleable iron	16.00*

Comparison of Prices . .

Advances over past week in **Heavy Type**; declines in *Italics*. Prices are f.o.b. major basing points. The various basing points for finished and semifinished steel are listed in the detailed price tables.

Flat-Rolled Steel: (cents per pound)	Jan. 1, 1946	Dec. 25, 1945	Nov. 27, 1945	Jan. 2, 1945
Hot-rolled sheets	2.20	2.20	2.20	2.10
Cold-rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.70	3.70	3.70	3.50
Hot-rolled strip	2.10	2.10	2.10	2.10
Cold-rolled strip	2.80	2.80	2.80	2.80
Plates	2.25	2.25	2.25	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c-r strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terneplate: (dollars per base box)				
Tinplate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tinplate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (cents per pound)				
Merchant bars	2.25	2.25	2.25	2.15
Cold-finished bars	2.75	2.75	2.75	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (cents per pound)				
Bright wire	2.75	2.75	2.75	2.60
Wire nails	2.90	2.90	2.90	2.55
Rails: (dollars per gross ton)				
Heavy rails	$43.00	$43.00	$43.00	$40.00
Light rails	45.00	45.00	45.00	40.00
Semifinished Steel: (dollars per gross ton)				
Rerolling billets	$36.00	$36.00	$36.00	$34.00
Sheet bars	36.00	36.00	36.00	34.00
Slabs, rerolling	36.00	36.00	36.00	34.00
Forging billets	42.00	42.00	42.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (cents per pound)				
Wire rods	2.15	2.15	2.15	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (per gross ton)	Jan. 1, 1946	Dec. 25, 1945	Nov. 27, 1945	Jan. 2, 1945
No. 2 foundry, Phila.	$27.59	$27.59	$27.59	$25.84
No. 2, Valley furnace	25.75	25.75	25.75	24.00
No. 2, Southern, Cin'ti	26.19	26.19	26.19	24.44
No. 2, Birmingham	22.13	22.13	22.13	20.38
No. 2 foundry, Chicago†	25.75	25.75	25.75	24.00
Basic, del'd eastern Pa.	27.09	27.09	27.09	25.34
Basic, Valley furnace	25.25	25.25	25.25	23.50
Malleable, Chicago†	25.75	25.75	25.75	24.00
Malleable, Valley	25.75	25.75	25.75	24.00
L. S. charcoal, Chicago	42.34	42.34	42.34	37.34
Ferromanganese‡	135.00	135.00	135.00	135.00

† The switching charge for delivery to foundries in the Chicago district is 60¢ per ton.
‡ For carlots at seaboard.

Scrap: (per gross ton)	Jan. 1, 1946	Dec. 25, 1945	Nov. 27, 1945	Jan. 2, 1945
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.32	17.32	17.32	17.32
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Chicago	20.00	20.00	20.00	20.00
Coke, Connellsville: (per net ton at oven)				
Furnace coke, prompt	$7.50	$7.50	$7.50	$7.00
Foundry coke, prompt	9.00	9.00	9.00	8.25
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin, Straits, New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, virgin, del'd	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

Composite Prices . .

Starting with the issue of Apr. 22, 1943, the weighted finished steel index was revised for the years 1941, 1942 and 1943. See explanation of the change on p. 90 of the Apr. 22, 1943 issue. Index revised to a quarterly basis as of Nov. 16, 1944; for details see p. 98 of that issue. The finished steel composite prices for the current quarter are an estimate based on finished steel shipments for the previous quarter. These figures will be revised when the actual data of shipments for this quarter are compiled.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Jan. 1, 1946	2.44076¢ per lb.	$25.37 per gross ton	$19.17 per gross ton
One week ago	2.44076¢ per lb.	$25.37 per gross ton	$19.17 per gross ton
One month ago	2.44076¢ per lb.	$25.37 per gross ton	$19.17 per gross ton
One year ago	2.21189¢ per lb.	$23.61 per gross ton	$19.17 per gross ton

	Finished Steel HIGH	Finished Steel LOW	Pig Iron HIGH	Pig Iron LOW	Scrap Steel HIGH	Scrap Steel LOW
1945	2.44076¢ Oct. 2	2.38444¢ Jan. 2	$25.37 Oct. 23	$23.61 Jan. 2	$19.17	$19.17
1944	2.30837¢ Sept. 5	2.21189¢ Oct. 5	$23.61	$23.61	19.17	$15.67 Oct. 24
1943	2.25513¢	2.25513¢	23.61	23.61	19.17	$19.17
1942	2.26190¢	2.26190¢	23.61	23.61	19.17	19.17
1941	2.43078¢	2.43078¢	$23.61 Mar. 20	$23.45 Jan. 2	$22.00 Jan. 7	$19.17 Apr. 10
1940	2.30467¢ Jan. 2	2.24107¢ Apr. 16	23.45 Dec. 23	22.61 Jan. 2	21.83 Dec. 30	16.04 Apr. 9
1939	2.35367¢ Jan. 3	2.26689¢ May 16	22.61 Sept. 19	20.61 Sept. 12	22.50 Oct. 3	14.08 May 16
1938	2.58414¢ Jan. 4	2.27207¢ Oct. 18	23.25 June 21	19.61 July 6	15.00 Nov. 22	11.00 June 7
1937	2.58414¢ Mar. 9	2.32263¢ Jan. 4	23.25 Mar. 9	20.25 Feb. 16	21.92 Mar. 30	12.67 June 8
1936	2.32263¢ Dec. 28	2.05200¢ Mar. 10	19.74 Nov. 24	18.73 Aug. 11	17.75 Dec. 21	12.67 June 9
1935	2.07642¢ Oct. 1	2.06492¢ Jan. 8	18.84 Nov. 5	17.83 May 14	13.42 Dec. 10	10.33 Apr. 29
1934	2.15367¢ Apr. 24	1.95757¢ Jan. 2	17.90 May 1	16.90 Jan. 27	13.00 Mar. 13	9.50 Sept. 25
1933	1.95578¢ Oct. 3	1.75836¢ May 2	16.90 Dec. 5	13.56 Jan. 3	12.25 Aug. 8	6.75 Jan. 3
1932	1.89196¢ July 5	1.83901¢ Mar. 1	14.81 Jan. 5	13.56 Dec. 6	8.50 Jan. 12	6.43 July 5
1931	1.99626¢ Jan. 13	1.86586¢ Dec. 29	15.90 Jan. 6	14.79 Dec. 15	11.33 Jan. 6	8.50 Dec. 29
1930	2.25488¢ Jan. 7	1.97319¢ Dec. 9	18.21 Jan. 7	15.90 Dec. 16	15.00 Feb. 18	11.25 Dec. 9
1929	2.31773¢ May 28	2.26498¢ Oct. 29	18.71 May 14	18.21 Dec. 17	17.58 Jan. 29	14.08 Dec. 3

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 pct of the United States output. Index recapitulated in Aug. 28, 1941 issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Iron and Steel Prices . . .

Steel prices shown here are f.o.b. basing points, in cents per pound or dollars per gross ton. Extras apply. Delivered prices do not reflect 3 pct tax on freight. (1) Mill run sheet, 10¢ per 100 lb under base; primes, 25¢ above base. (2) Unassorted commercial coating. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25¢ per 100 lb to fabricators. (8) Also shafting. For quantities of 20,000 lb. to 39,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (11) Boxed. (12) This base price for annealed, bright finish wires, commercial spring wire. (13) Produced to dimensional tolerances in AISI Manual Sect. 6. (14) Billets only. (15) 9/32 in. to 47/64 in., 0.15c. per lb higher.

													DELIVERED TO		
Basing Points	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars [10]	Detroit	New York	Philadelphia
INGOTS Carbon, rerolling								($31.00 f.o.b. mill)							
Carbon, forging	$36	$36	$36	$36	$36	$36	$36								
Alloy	$45	$45				$45			(Bethlehem, Massillon, Canton, Coatesville=$45)						
BILLETS, BLOOMS, SLABS Carbon, rerolling	$36	$36	$36	$36	$36	$36	$36	$36	(Provo=$47.20, Duluth=$38[14])			$48[14]	$38		
Carbon, forging	$42	$42	$42	$42	$42	$42	$42		(Provo=$53.20, Duluth=$44[14])			$54[14]	$44		
Alloy	$54	$54				$54			(Bethlehem, Massillon, Canton=$54)				$56		
SHEET BARS	$36	$36		$36		$36	$36	$36		(Canton=$36)					
PIPE SKELP	1.90¢	1.90¢					1.90¢	1.90¢			(Coatesville=1.90¢)				
WIRE RODS[15] No. 5 to 9/32 in.	2.15¢	2.15¢		2.15¢	2.15¢			(Worcester=2.25¢)			2.40¢	2.65¢			
SHEETS Hot-rolled	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.30¢	2.20¢		2.75¢	2.30¢	2.44¢	2.37¢
Cold-rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 gage)	3.70¢	3.70¢	3.70¢		3.70¢	3.70¢	3.70¢	3.70¢	3.80¢	3.70¢		4.25¢		3.94¢	3.87¢
Enameling (20 gage)	3.45¢	3.45¢	3.45¢	3.45¢			3.45¢		3.55¢	3.45¢		4.10¢	3.55¢	3.81¢	3.77¢
Long ternes[2]	3.80¢	3.80¢	3.80¢									4.55¢		4.16¢	4.12¢
STRIP Hot-rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold-rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester=3.00¢)					2.90¢	3.16¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity cold-rolled	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester=3.35¢)					3.05¢	3.31¢	
TINPLATE Standard cokes, base box	$5.00	$5.00	$5.00						$5.10					$5.36	$5.32
Electro, box 0.25 lb 0.50 lb 0.75 lb	$4.35 $4.50 $4.65	$4.35 $4.50	$4.35 $4.50 $4.65						 $4.60 $4.75						
BLACKPLATE 29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[11]			3.37¢
TERNES, MFG. Special coated, base box	$4.30	$4.30	$4.30						$4.40						
BARS Carbon steel	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25	(Duluth=2.35¢, Provo, Utah 2.95¢)			2.60¢	2.90¢	2.35¢	2.59¢	2.57¢
Rail steel[6]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢					2.60¢	2.90¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢	2.25¢	2.39¢	
Reinforcing (rail)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢	2.25¢		2.47¢
Cold-finished[8]	2.75¢	2.75¢	2.75¢	2.75¢		2.75¢			(Detroit=2.80¢)		(Toledo=2.90¢)			3.09¢	3.07¢
Alloy, hot-rolled	2.70¢	2.70¢				2.70¢	2.70	(Bethlehem, Massillon, Canton=2.70¢)					2.80¢		
Alloy, cold-drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
PLATES Carbon steel[13]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢		2.25¢	2.25¢	(Coatesville and Claymont=2.25¢, Provo, Utah 2.95¢)		2.60¢	2.80¢	2.47¢	2.44¢	2.30¢
Floor plates	3.50¢	3.50¢									3.85¢	4.15¢		3.86¢	3.82¢
Alloy	3.50¢	3.50¢				(Coatesville=3.50¢)					3.95¢	4.15¢		3.70¢	3.59¢
SHAPES Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem=2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R 0.26 to 0.50 carbon	2.80¢			2.80¢			(Worcester=3.00¢)								
0.51 to 0.75 carbon	4.30¢			4.30¢			(Worcester=4.50¢)								
0.76 to 1.00 carbon	6.15¢			6.15¢			(Worcester=6.35¢)								
1.01 to 1.25 carbon	8.35¢			8.35¢			(Worcester=8.55¢)								
WIRE[9] Bright[12]	2.75¢	2.75¢		2.75¢	2.75¢		(Worcester=2.85¢)			(Duluth=2.80¢)		3.25¢			3.07¢
Galvanized					Add proper size extra and galvanizing extra to Bright Wire base										
Spring (high carbon)	3.35¢	3.35¢		3.35¢			(Worcester=3.45¢)					3.85¢			3.67¢
PILING Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

MULTIPRESS Does it Again!

CUTS COST OF CLEANING CASTINGS

At the UNIVERSAL CASTINGS CORPORATION

Small castings of close tolerance are cleaned with low-cost efficiency on MULTIPRESS, with the high accuracy indicated in these "before and after" illustrations.

With its remarkably easy and *exact* control of smooth oil-hydraulic power—in amazingly rugged and compact form—MULTIPRESS continues to cut costs, boost output and improve quality on production jobs of every sort.

MULTIPRESS is shown above in action at the Universal Castings Corporation (Capaco Process) in Chicago, where it is specially tooled to clean plaster-molded aluminum, brass and bronze castings. The close tolerances and smooth finish of these castings emphasize the need for precision in the cleaning operation. The firm reports that these MULTIPRESS units have brought marked savings in their cleaning department.

MULTIPRESS users in many other fields have cited facts and figures showing greatly reduced "down time" for maintenance and tooling setups . . . drastic reduction of noise . . . lowered fatigue for operators . . . increased safety . . . lower initial tooling investment . . . important savings in floor space . . . and other production advantages.

A wide choice of models in 4, 6, and 8 ton capacities, with either manual or automatic cycling controls, offer an exceptionally wide range of Multipress ram actions. Standard accessories for further Multipress adaptability include straightening fixtures, extension tables, bolster plates, indexing tables—and the sensational new Vibratory Ram Action, providing short, uniform, closely regulative strokes at frequencies up to 500 per minute!

Write today for latest complete details on MULTIPRESS.

THE DENISON ENGINEERING COMPANY

1158 Dublin Road, Columbus 16, Ohio

FLEXIBLE POWER PLUS ACCURATE CONTROL

DENISON EQUIPMENT *in* APPLIED HydrOILics

CORROSION AND HEAT RESISTANT STEELS

In cents per pound, f.o.b. basing point

BASING POINT	Chromium Nickel		Straight Chromium			
	No. 304	No. 302	No. 410	No. 430	No. 442	No. 446
Ingot, P'gh, Chi, Canton, Balt, Reading, Ft. Wayne, Phila	Subject to negotiation			Subject to negotiation		
Blooms, P'gh, Chi, Canton, Phila, Reading, Ft. Wayne, Balt	21.25	20.40	15.725	16.15	19.125	23.375
Slabs, P'gh, Chi, Canton, Balt, Phila, Reading	21.25	20.40	15.725	16.15	19.125	23.375
Billets, P'gh, Chi, Canton, Newark, N. J., Watervliet, Syracuse, Balt	Subject to negotiation			Subject to negotiation		
Billets, forging, P'gh, Chi, Canton, Dunkirk, Balt, Phila, Reading, Watervliet, Syracuse, Newark, N. J., Ft. Wayne, Titusville	21.25	20.40	15.725	16.15	19.125	23.375
Bars, h-r, P'gh, Chi, Canton, Dunkirk, Watervliet, Newark, N. J., Syracuse, Balt, Phila, Reading, Ft. Wayne, Titusville	25.00	24.00	18.50	19.00	22.50	27.50
Bars, c-f, P'gh, Chi, Cleve, Canton, Dunkirk, Newark, N. J., Syracuse, Balt, Phila, Reading, Ft. Wayne, Watervliet	25.00	24.00	18.50	19.00	22.50	27.50
Plates, P'gh, Middletown, Canton	29.00	27.00	21.50	22.00	26.50	30.50
Shapes, structural, P'gh, Chi	25.00	24.00	18.50	19.00	22.50	27.50
Sheets, P'gh, Chi, Middletown, Canton, Balt	36.00	34.00	26.50	29.00	32.50	36.50
Strip, h-r, P'gh, Chi, Reading, Canton, Youngstown	23.50	21.50	17.00	17.50	24.00	35.00
Strip, c-r, P'gh, Cleve, Newark, N. J., Reading, Canton, Youngstown	30.00	28.00	22.00	22.50	32.00	52.00
Wire, c-d, Cleve, Dunkirk, Syracuse, Balt, Reading, Canton, P'gh, Newark, N. J., Phila	25.00	24.00	18.50	19.00	22.50	27.50
Wire flat, c-r, Cleve, Balt, Reading, Dunkirk, Canton	30.00	28.00	22.00	22.50	32.00	52.00
Rod, h-r, Newark, N. J. Syracuse	25.00	24.00	18.50	19.00	22.50	27.50
Tubing, seamless, P'gh Chi, Canton, (4 in. to 6 in.)	66.63	66.63	.....	63.30	.....	.....

SHELL STEEL

	per gross ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic openhearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher; East Michigan, $3 higher.

Price Exceptions: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	per lb
Field grade	3.30¢
Armature	3.65¢
Electrical	4.15¢
Motor	5.05¢
Dynamo	5.75¢
Transformer 72	6.25¢
Transformer 65	7.25¢
Transformer 58	7.75¢
Transformer 52	8.55¢

F.o.b. Granite City, add 10¢ per 100 lb on field grade to and including dynamo; f.o.b. Chicago and Gary, Ind., add 3¢ per 100 lb on field grade through motor. Pacific ports add 75¢ per 100 lb on all grades.

RAILS, TRACK SUPPLIES

(F.o.b. mill)

Standard rails, heavier than 60 lb No. 1 O.H., gross ton	$43.00
Angle splice bars, 100 lb	2.70
(F.o.b. basing points)	*per gross ton*
Light rails (from billets)	$45.00
Light rails (from rail steel)	44.00
	base per lb
Cut spikes	3.25¢
Screw spikes	5.40¢
Tie plate, steel	2.30¢
Tie plates, Pacific Coast	2.45¢
Track bolts	4.75¢
Track bolts, heat treated, to railroads	5.00¢
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25¢.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse, Dunkirk)

*(*Also Canton, O.)*	*base per lb*
High speed	67¢
Straight molybdenum	54¢
Tungsten-molybdenum	57½¢
High-carbon-chromium*	43¢
Oil hardening*	24¢
Special carbon*	22¢
Extra carbon*	18¢
Regular carbon*	14¢

Warehouse prices east of Mississippi are 2¢ per lb higher; west of Mississippi 3¢ higher.

CLAD STEEL

Base prices, cents per pound

	Plate	Sheet
Stainless-clad No. 304, 20 pct, f.o.b. Pittsburgh, Washington, Pa.	18.00*	19.00
Nickel-clad 10 pct, f.o.b. Coatesville, Pa.	18.00	....
Inconel-clad 10 pct, f.o.b. Coatesville	25.00	....
Monel-clad 10 pct, f.o.b. Coatesville	24.00	....
Aluminized steel Hot dip, 20 gage, f.o.b. Pittsburgh	....	9.00

*Includes annealing and pickling.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	base per keg	
Standard wire nails	$2.90	$3.40
Coated nails	2.90	3.40
Cut nails, carloads	3.85	....
	base per 100 lb	
Annealed fence wire	$3.20	$3.70
Annealed galv. fence wire	3.55	4.05
	base column	
Woven wire fence*	67	85
Fence posts, carloads	69	86
Single loop bale ties	66	91
Galvanized barbed wire**	72	82
Twisted barbless wire	72	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

ROOFING TERNEPLATE

(F.o.b. Pittsburgh, 112 sheets)

	20x14 in.	20x28 in.
8-lb coating I.C.	$6.00	$12.00
15-lb coating I.C.	7.00	14.00
20-lb coating I.C.	7.50	15.00

ALLOY EXTRAS

Alloy Steel	Basic Openhearth		Electric Furnace	
	Bars and Bar-strip	Billets, Blooms, and Slabs	Bars and Bar-strip	Billets, Blooms, and Slabs
NE 8600	0.65¢	$13.00	$1.15	$23.00
NE 8700	0.70	14.00	1.20	24.00
NE 9400	0.75	15.00	1.25	25.00
NE 9700	0.65	13.00	1.15	23.00
NE 9800	1.30	26.00	1.80	36.00
NE 9900	1.20	24.00	1.55	31.00

The extras shown are in addition to the base price of $2.70 per 100 lb on finished products and $54 per gross ton on semifinished steel, major basing points, as shown in table, opposite page, and are in cents per pound when applicable to bars and bar-strip and in dollars per gross ton when applicable to billets, blooms and slabs. When acid openhearth is specified and acceptable, add to basic openhearth alloy differential 0.25¢ per lb for bars and bar-strip and $5 per gross ton for billets, blooms and slabs.

WELDED PIPE AND TUBING

Base discounts, f.o.b. Pittsburgh district and Lorain, Ohio, mills

(F.o.b. Pittsburgh only on wrought pipe) base price—$200.00 per net ton

Steel (buttweld)

	Black	Galv.
½-in.	63½	51
¾-in.	66½	55
1-in. to 3-in.	68½	57½

Wrought Iron (buttweld)

½-in.	24	3½
¾-in.	30	10
1-in. and 1¼-in.	34	16
1½-in.	38	18½
2-in.	37½	18

Steel (lapweld)

2-in.	61	49½
2½-in. and 3-in.	64	52½
3½-in. to 6-in.	66	54½

Wrought Iron (lapweld)

2-in.	30½	12
2½-in. to 3½-in.	31½	14½
4-in.	33½	18
4½-in. to 8-in.	32½	17

Steel (butt, extra strong, plain ends)

½-in.	61½	50½
¾-in.	65½	54½
1-in. to 3-in.	67	57

Wrought Iron (same as above)

½-in.	25	6
¾-in.	31	12
1-in. to 2-in.	38	19½

Steel (lap, extra strong, plain ends)

2-in.	59	48½
2½-in. and 3-in.	63	52½
3½-in. to 6-in.	66½	56

Wrought Iron (same as above)

2-in.	33½	15½
2½-in. to 4-in.	39	22½
4½-in. to 6-in.	37½	21

On buttweld and lapweld steel pipe jobbers are granted a discount of 5 pct. On l.c.l. shipments prices are determined by adding 25 pct and 30 pct and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lapweld and one point lower discount, or $2 a ton higher on all buttweld.

BOILER TUBES

Seamless steel and lapweld commercial boiler tubes and locomotive tubes, minimum wall. Net base prices per 100 ft f.o.b. Pittsburgh, in carload lots.

	Seamless Cold-Drawn	Seamless Hot-Rolled	Lap-weld, Hot-Rolled
2 in. O.D. 13 B.W.G.	15.03	13.04	13.38
2½ in. O.D. 12 B.W.G.	20.21	17.54	16.58
3 in. O.D. 12 B.W.G.	22.48	19.50	18.35
3½ in. O.D. 11 B.W.G.	28.37	24.62	23.15
4 in. O.D. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb or ft and over	Base
30,000 lb or ft to 39,999 lb or ft	5 pct
20,000 lb or ft to 29,999 lb or ft	10 pct
10,000 lb or ft to 19,999 lb or ft	20 pct
5,000 lb or ft to 9,999 lb or ft	30 pct
2,000 lb or ft or 4,999 lb or ft	45 pct
Under 2,000 lb or ft	65 pct

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger, f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect 3 pct tax on freight rates.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts

Base discount less case lots

	Percent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed

(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 pct for full container quantities. There is an additional 5 pct allowance for carload shipments.

Semifin. Hexagon Nuts

Base discount less keg lots

	U.S.S.	S.A.E.
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. through 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 pct additional discount.

Stove Bolts

	Consumer
Packages, nuts loose	71 and 10
In packages	71
In bulk	80

On stove bolts freight allowed up to 65¢ per 100 lb based on Cleveland, Chicago, New York on lots of 200 lb or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets

(7/16 in. and smaller)

	Percent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws

	Consumer Percent Off List
Upset full fin, hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65¢ per 100 lb based on Cleveland, Chicago or New York on lots of 200 lb or over.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Div. certifies in writing the consumers need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, cents per lb, ton lots.

Copper, electrolytic, 150 and 200 mesh	21½¢ to 23½¢
Copper, reduced, 150 and 200 mesh	20½¢ to 25½¢
Iron, commercial, 100 and 200 mesh 96 + % Fe	12½¢ to 15¢
Iron, crushed, 200 mesh and finer, 90 + % Fe carload lots	4¢
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots	63¢
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33¢
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42¢
Iron carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90¢
Aluminum, 100 and 200 mesh	*25¢
Antimony, 100 mesh	30¢
Cadmium, 100 mesh	$1.40
Chromium, 100 mesh and finer	$1.25
Lead, 100, 200 & 300 mesh	11½ to 15¢
Manganese	65¢
Nickel, 150 mesh	51½¢
Solder powder, 100 mesh	8½¢ plus metal
Tin, 100 mesh	58¾¢
Tungsten metal powder, 98%-99%, any quantity, per lb	$2.60
Molybdenum powder, 99%, in 200-lb kegs, f.o.b. York, Pa., per lb	$2.60
Under 100 lb	$3.00

*Freight allowed east of Mississippi.

COKE

	Net Ton
Furnace, beehive (f.o.b. oven)	
Connellsville, Pa.	$7.50*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	9.00
Foundry, Byproduct	
Chicago, del'd	13.75
Chicago, f.o.b.	13.00
New England, del'd	14.65
Kearny, N. J., f.o.b.	13.05
Philadelphia, del'd	13.28
Buffalo, del'd	13.40
Portsmouth, Ohio, f.o.b.	11.50
Painesville, Ohio, f.o.b.	12.15
Erie, del'd	13.15
Cleveland, del'd	13.30
Cincinnati, del'd	13.25
St. Louis, del'd	14.25
Birmingham, del'd	10.90

*Hand drawn ovens using trucked coal permitted to charge $8.60 per ton plus transportation charges.

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

	Per 1000
Super-duty brick, St. Louis	$68.50
First quality, Pa., Md., Ky., Mo., Ill.	54.40
First quality, New Jersey	59.35
Sec. quality, Pa., Md., Ky., Mo., Ill.	49.35
Sec. quality, New Jersey	51.95
No. 1 Ohio	45.60
Ground fire clay, net ton	8.05

Silica Brick

Pennsylvania and Birmingham	$54.40
Chicago District	62.45
Silica cement, net ton (Eastern)	9.55

Chrome Brick

	Per Net Ton
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00

Magnesite Brick

Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. in bulk	22.00
in sacks	26.00

LAKE SUPERIOR ORES

(51.50% Fe, Natural Content, Delivered Lower Lake Ports)*

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS Hot Rolled (10 gage)	SHEETS Cold Rolled	SHEETS Galvanized (24 gage)	STRIP Hot Rolled	STRIP Cold Rolled	Plates ¼ in. and heavier	Structural Shapes	BARS Hot Rolled	BARS Cold Finished	ALLOY BARS Hot Rolled, NE 8617-20	ALLOY BARS Hot Rolled, NE 9442-45 Ann.	ALLOY BARS Cold Drawn, NE 8617-20	ALLOY BARS Cold Drawn, NE 9442-45 Ann.
**Philadelphia	$3.518	$4.872§	$4.768a	$3.922	$4.772	$3.605	$3.666	$3.822	$4.172	$5.816	$6.866	$7.072	$8.172
New York	3.59	4.613[3]	5.110	3.974[6]	4.772	3.768	3.758	3.853	4.203	5.858	6.908	7.103	8.203
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.244	6.012	7.062	7.194	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.152	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.265	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.85	5.60	6.65	6.65	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.987	5.837	6.887	6.887	7.987
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.85	5.806	6.856	6.65	7.75
Buffalo	3.35	4.40	4.75[4]	3.819	4.669	3.63	3.40	3.35	3.85	5.60	6.65	6.65	7.75
Detroit	3.45	4.50	5.00[4]	3.70	4.859[17]	3.609	3.661	3.45	3.90	5.93	6.98	6.959	8.059
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.661	3.691	3.611	4.111	5.95	7.00	7.011	8.261
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.131	5.981	7.031	7.031	8.131
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.85	5.60	6.65	6.65	7.90
St. Paul	3.50	4.46	5.257[4]	3.86	5.102[17]	3.81[13]	3.81[13]	3.76[13]	3.461	5.94	5.99	7.361	8.461
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.543	....	....	....	....
Indianapolis	3.518	4.568	4.918	3.768	4.741	3.63	3.63	3.58	4.00	5.93	6.98	6.98	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.53	....	....	....	....
Memphis	3.965[7]	4.66	5.268	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	5.079	5.358	4.308	....	4.158	4.158*	4.108*	4.729	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.473[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20[3]	6.10[4]	4.95	5.613[15]	4.95	4.65	4.40	5.683	8.204	9.404	9.304	10.454
San Francisco	4.55[14]	7.30[4]	6.35[4]	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.433	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.05[4]	5.95[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.883	....	9.404	....	....
Portland	4.65[11]	6.60[4]	5.75[4]	4.75[11]	....	4.85[11]	4.45[11]	4.45[11]	5.633	8.304	9.404	8.304	9.404
Salt Lake City	4.530[17]	....	6.17[13]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	6.00	....	....	....	....

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT-ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD-ROLLED: Sheets, 400 to 1499 lb; strip, extras on all quantities; bars, 1500 lb base.

NE ALLOY BARS: 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 199 lb. (7) 400 to 1499 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb and over. (15) 1000 lb and over. (16) 1500 lb and over. (17) 2000 lb and over. (18) 3500 lb and over.

(a) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271¢ for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

PIG IRON PRICES

Maximum per gross ton, established by OPA Oct. 22, 1945. Prices do not reflect 3 pct tax on freight.

BASING POINT PRICES

Basing Point	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Bethlehem	$26.25	$26.75	$27.25	$27.75	.....
Birdsboro	26.25	26.75	27.25	27.75	$31.25
Birmingham	20.75	22.13	.....	26.75	.....
Buffalo	24.75	25.75	26.25	26.75	31.25
Chicago	25.25	25.75	25.75	26.25	.....
Cleveland	25.25	25.75	25.75	26.25	.....
Detroit	25.25	25.75	25.75	26.25	.....
Duluth	25.75	26.25	26.25	26.75	.....
Erie	25.25	25.75	26.25	26.75	.....
Everett	26.25	26.75	27.25	27.75	.....
Granite City	25.25	25.75	25.75	26.25	.....
Hamilton	25.25	25.75	25.75	.....	.....
Neville Island	25.25	25.75	25.75	26.25	.....
Provo	23.25	23.75	.....	.....	.....
Sharpsville [1]	25.25	25.75	25.75	26.25	.....
Sparrows Point	26.25	26.75	.....	.....	.....
Steelton	26.25	.....	.....	.....	31.25
Swedeland	26.25	26.75	27.25	27.75	.....
Toledo	25.25	25.75	25.75	26.25	.....
Youngstown	25.25	25.75	25.75	26.25	.....

DELIVERED PRICES (BASE GRADES)

Consuming Point	Basing Point	Freight Rate	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Boston	Everett	$ .50	$26.75	$27.25	$27.75	$28.25	.....
Boston	Birdsboro-Steelton	4.02	.....	.....	.....	.....	$35.27
Brooklyn	Bethlehem	2.50	28.75	29.25	29.75	30.25	.....
Brooklyn	Birdsboro	2.92	.....	.....	.....	.....	34.17
Canton	Cle, Yngstn, Sharpsvil.	1.39	26.64	27.14	27.14	27.64	.....
Canton	Buffalo	3.19	.....	.....	.....	.....	34.44
Cincinnati	Birmingham	4.06	24.81	26.19	.....	.....	.....
Cincinnati	Hamilton	1.11	.....	.....	26.86	.....	.....
Cincinnati	Buffalo	4.40	.....	.....	.....	.....	35.65
Jersey City	Bethlehem	1.53	27.78	28.28	28.78	29.28	.....
Jersey City	Birdsboro	1.94	.....	.....	.....	.....	33.19
Los Angeles	Provo	4.95	28.20	28.70	.....	.....	.....
Los Angeles	Buffalo	15.41	.....	.....	.....	.....	46.66
Mansfield	Cleveland & Toledo	1.94	27.19	27.69	27.69	28.19	.....
Mansfield	Buffalo	3.36	.....	.....	.....	.....	34.61
Philadelphia	Swedeland	.84	27.09	27.59	28.09	28.59	.....
Philadelphia	Birdsboro	1.24	.....	.....	.....	.....	32.49
San Francisco	Provo	4.95	28.20	28.70	.....	.....	.....
San Francisco	Buffalo	15.41	.....	.....	.....	.....	46.66
Seattle	Provo	4.95	28.20	28.70	.....	.....	.....
Seattle	Buffalo	15.41	.....	.....	.....	.....	46.66
St. Louis	Granite City	.50	25.75	26.25	26.25	26.75	.....
St. Louis	Buffalo	7.07	.....	.....	.....	.....	38.32

(1) Struthers Iron & Steel Co., Struthers, Ohio, may charge 50¢ a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

Charcoal pig iron base prices for Lyles, Tenn., and Lake Superior furnaces, $33.00 and $34.00, respectively. Newberry Brand of Lake Superior charcoal iron $39.00 per g.t., f.o.b. furnace, by order L 39 to RPS 10. Apr. 11, 1945, retroactive to Mar. 7, 1945. Delivered to Chicago, $42.34. High phosphorus iron sells at Lyles, Tenn., at $28.50.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50¢ a ton for each 0.25 pct silicon content in excess of base grade which is 1.75 to 2.25 pct); Phosphorus differentials, a reduction of 38¢ per ton for phosphorus content of 0.70 pct and over; Manganese differentials, a charge not to exceed 50¢ per ton for each 0.50 pct manganese content in excess of 1.00 pct. Effective Mar. 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 pct nickel content and $1 per ton extra for each additional 0.25 pct nickel.

Silvery iron and bessemer ferrosilicon up to and including 14.00 pct silicon covered by RPS 10 as amended Feb. 14, 1945. Silvery iron, silicon 6.00 to 6.50 pct, C/L per g.t., f.o.b. Jackson, Ohio—$31.25; f.o.b. Buffalo—$32.50. Add $1.00 per ton for each additional 0.50 pct Si. Add 50¢ per ton for each 0.50 pct Mn over 1.00 pct. Add $1.00 per ton for prices of comparable analysis.

WHEN YOU

CALL SALEM

ABOUT HEATING FURNACES

STEP 6

SALEM STAYS ON YOUR JOB BEFORE AND AFTER

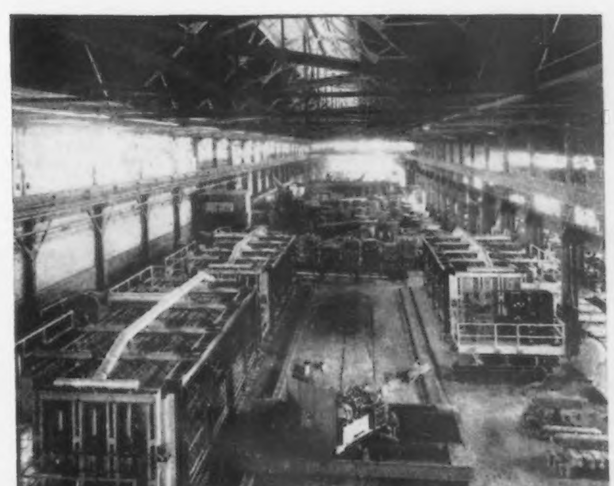
Salem's obligation to you, the buyer of heating furnaces and equipment, does not halt with construction.

After completion, Salem's heating engineers operate the equipment themselves to make certain it will perform as designed. At the same time, they instruct your men in its operation.

Afterwards, Salem men periodically check with you on the operation of the installation and to keep you informed on new heating developments.

This close co-operation between you and Salem from original plans down through the paper and blueprint stage, gives you the result you want—an efficient and economical heating furnace or equipment installation.

CALL SALEM for any type, size, or style of heating furnace or allied equipment.



Salem, builders of the world's largest rotary forge furnace and originators of Engineered Heat, have issued a new 16-page, illustrated booklet entitled "Engineered Heat." You will like the easy-to-use heating and temperature charts. A copy will be mailed to your personal attention promptly upon request. Send today.

SALEM
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SALEM, OHIO

SALEM ENGINEERING COMPANY

Engineered Heat

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Less ton lots (packed)	148.50
F.o.b. Pittsburgh	139.50

$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Ferromanganese Briquets

Contract prices per pound of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 66% contained Mn. Add 0.25¢ for spot sales.

	Eastern	Central	Western
Carload, bulk	6.05¢	6.30¢	6.60¢
Ton lots	6.65¢	7.55¢	8.55¢
Less ton lots	6.80¢	7.80¢	8.80¢

Manganese Metal

Contract basis, lump size, per pound of metal, f.o.b. shipping point with freight allowed. Spot sales add 2¢ per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	30¢
L.c.l. lots	32¢

Electrolytic Manganese

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, cents per pound.

Carloads	34¢
Ton lots	36¢
Less ton lots	38¢

Spiegeleisen

Maximum base contract prices per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50
F.o.b. Pittsburgh, Chicago		40.00

Low-Carbon Ferromanganese

Contract prices per pound of manganese contained, lump size, f.o.b. shipping point, freight allowed to destination, eastern zone. Add 0.25¢ for spot sales.

	Carloads	Ton	Less
0.06% C, 0.06% P, 90% Mn	23.00¢	23.40¢	23.65¢
0.10% max. C, 1% or 2% max. Si	23.00¢	23.40¢	23.65¢
0.15% max. C, 1% or 2% max. Si	22.00¢	22.40¢	22.65¢
0.30% max. C, 1% or 2% max. Si	21.00¢	21.40¢	21.65¢
0.50% max. C, 1% or 2% max. Si	20.00¢	20.40¢	20.65¢
0.75% max. C, 7.00% max. Si	16.00¢	16.40¢	16.65¢

Electric Ferrosilicon

OPA maximum base price cents per pound contained Si, lump size in carloads, f.o.b. shipping point with freight allowed.

	Eastern	Central	Western
50% Si	6.65¢	7.10¢	7.25¢
75% Si	8.05¢	8.20¢	8.75¢
80-90% Si	8.90¢	9.05¢	9.55¢
90-95% Si	11.05¢	11.20¢	11.65¢

Silvery Iron

Si 14.01 to 14.50%, $45.50 per G. T. f.o.b. Jackson, Ohio; $48.75 f.o.b. Keokuk, Iowa; $46.75 f.o.b. Niagara Falls. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 per ton for low impurities, not to exceed: P—0.05%, S—0.04%, C—1.00%. Covered by MPR 405.

Silicon Metal

OPA maximum base price per pound of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb, packed. Add 0.25¢ for spot sales.

	Eastern	Central	Western
96% Si, 2% Fe	13.10¢	13.55¢	16.50¢
97% Si, 1% Fe	13.45¢	13.90¢	16.80¢

Ferrosilicon Briquets

OPA maximum base price per pound of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add 25¢ for spot sales.

	Eastern	Central	Western
Carload, bulk	3.35¢	3.50¢	3.65¢
2000 lb-carload	3.80¢	4.20¢	4.25¢

Silicomanganese

Contract basis lump size, per pound of metal, f.o.b. shipping point with freight allowed. Add 25¢ for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05¢
2000 lb to carload	6.70¢
Briquet, contract basis, carlots, bulk freight allowed, per lb	5.80¢
2000 lb to carload	6.30¢
Less ton lots	6.55¢

Ferrochrome

(65-72% Cr, 2% max. Si)

OPA maximum base contract prices per pound of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add 0.25¢ per lb contained Cr for spot sales.

	Eastern	Central	Western
0.06% C	23.00¢	23.40¢	24.00¢
0.10% C	22.50¢	22.90¢	23.50¢
0.15% C	22.00¢	22.40¢	23.00¢
0.20% C	21.50¢	21.90¢	22.50¢
0.50% C	21.00¢	21.40¢	22.00¢
1.00% C	20.50¢	20.90¢	21.50¢
2.00% C	19.50¢	19.90¢	21.00¢
66-71% Cr, 4-10% C	13.00¢	13.40¢	14.00¢
62-66% Cr, 5-7% C	13.50¢	13.90¢	14.50¢

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2¢ per lb to regular low-carbon ferrochrome price schedule. Add 2¢ for each additional 0.25% N. High-carbon type: 66-71% Cr, 4-5% C, 0.75% N. Add 5¢ per lb to regular high-carbon ferrochrome price schedule.

Ferrochrome Briquets

Contract prices per pound of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 60% contained chromium. Add 0.25¢ for spot sales.

	Eastern	Central	Western
Carload, bulk	8.25¢	8.55¢	8.95¢
Ton lots	8.75¢	9.25¢	10.75¢
Less ton lots	9.00¢	9.50¢	11.00¢

Calcium—Manganese—Silicon

Contract prices per pound of alloy, lump size, f.o.b. shipping point, freight allowed to destination.

16-20% Ca, 14-18% Mn, 53-59% Si. Add 0.25¢ for spot sales.

	Eastern	Central	Western
Carloads	15.50¢	16.00¢	18.05¢
Ton lots	16.50¢	17.35¢	19.10¢
Less ton lots	17.00¢	17.35¢	19.60¢

Calcium Metal

Eastern zone contract prices per pound of metal, f.o.b. shipping point, freight allowed to destination. Add 5¢ for spot sales. Add 0.9¢ for central zone; 0.49¢ for western zone.

	Cast	Turnings	Distilled
Ton lots	$1.80	$2.30	$5.00
Less ton lots	2.30	2.80	5.75

Chromium—Copper

Contract price per pound of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi. 8-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si. Add 2¢ for spot sales.

Shot or ingot	45¢

Ferroboron

Contract prices per pound of alloy, f.o.b. shipping point, freight allowed to destination. Add 5¢ for spot sales. 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% Max. C.

	Eastern	Central	Western
Ton lots	$1.20	$1.2075	$1.229
Less ton lots	1.30	1.3075	1.329

Manganese—Boron

Contract prices per pound of alloy, f.o.b. shipping point, freight charges allowed. Add 5¢ for spot sales.

75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C.

	Eastern	Central	Western
Ton lots	$1.89	$1.903	$1.935
Less ton lots	2.01	2.023	2.055

Nickel—Boron

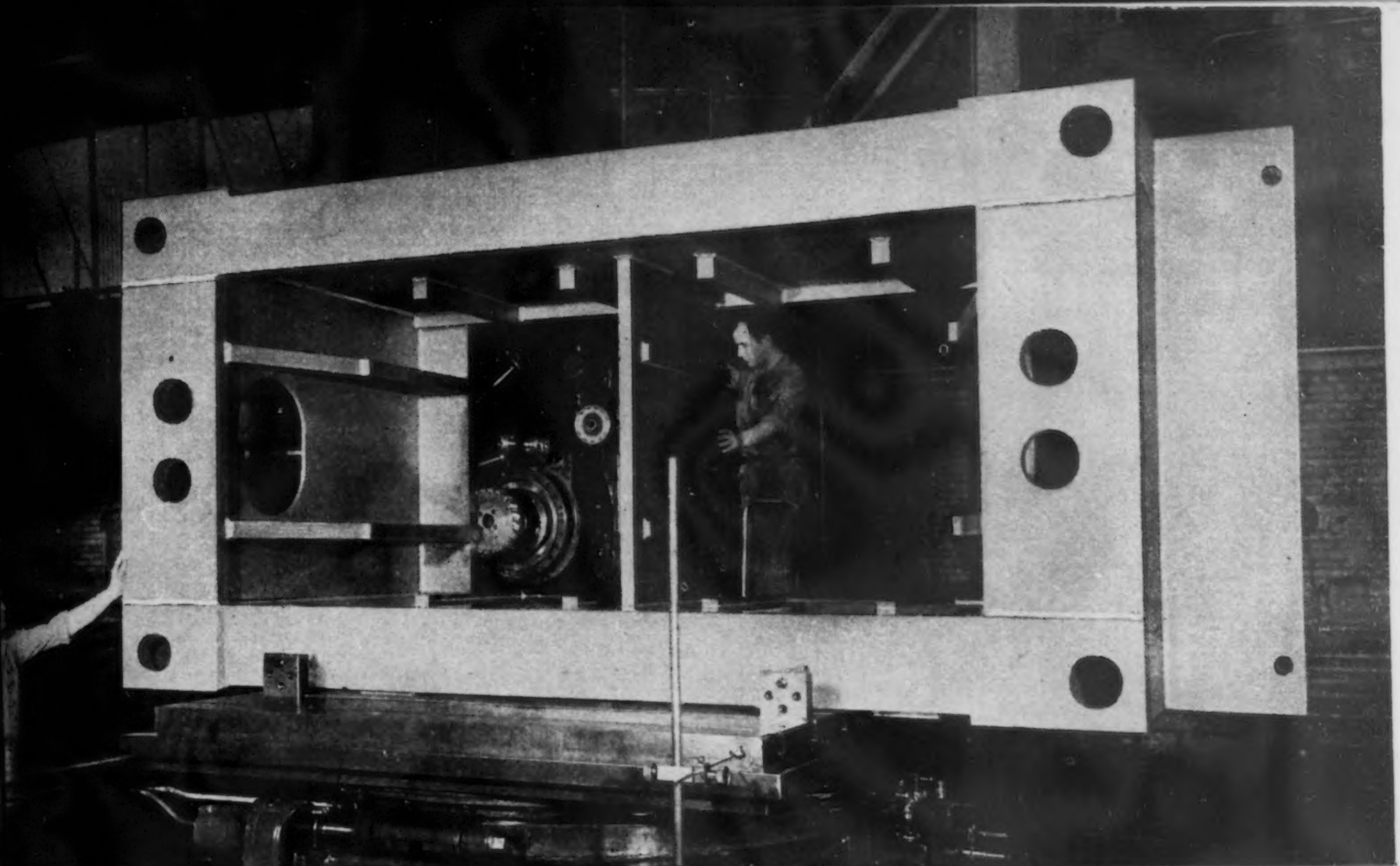
Spot and contract prices per pound of alloy, f.o.b. shipping point, freight allowed to destination.

15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni.

	Eastern	Central	Western
11,200 lb or more	$1.90	$1.9125	$1.9445
Ton lots	2.00	2.09125	2.0445
Less ton lots	2.10	2.1125	2.1445

Other Ferroalloys

Ferrotungsten, standard grade lump or ¼X down, packed f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per pound contained tungsten, 10,000 lb or more	$1.90
Ferrovanadium, 35-55%, contract basis, f.o.b. plant, usual freight allowances, per pound contained V.	
Openhearth	$2.70
Crucible	$2.80
Primos	$2.90
Cobalt, 97% min., keg packed, contract basis, f.o.b. producers plant, usual freight allowances, per pound of cobalt metal	$1.50
Vanadium pentoxide, 88-92% V_2O_5 technical grade, contract basis, any quantity, per pound conatined V_2O_5. Spot sales add 5¢ per lb contained V_2O_5	$1.10
Silcaz No. 3, contract basis, f.o.b. plant with usual freight allowances, per pound of alloy.	
carload lots	25¢
2000 lb to carload	26¢
Silvaz No. 3, contract basis, f.o.b. plant with freight allowances, per pound of alloy.	
Carload lots	58¢
2000 lb to carload	59¢
Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb and over, max. based on rate to St. Louis	
No. 1	87.5¢
No. 6	60¢
No. 79	45¢
Bortram, f.o.b. Niagara Falls	
Ton lots, per lb	45¢
Less ton lots, per lb	50¢
Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per pound contained Cb.	
2000-lb lots	$2.25
Under 2000-lb lots	$2.30
Ferrotitanium, 40-45%, 0.10%C. max. f.o.b. Niagara Falls, N. Y., ton lots, per pound contained Ti	$1.23
Less ton lots	$1.25
Ferrotitanium, 20-25%, 0.10%C. max., ton lots, per pound contained titanium	$1.35
Less ton lots	$1.40
High-carbon ferrotitanium, 15-20%, 6-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y. freight allowed east of Mississippi, north of Baltimore and St. Louis, per carload	$142.50
Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton	$75.00
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per pound contained Mo.	95¢
Calcium molybdate, 40-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per pound contained Mo	80¢
Molybdenum oxide briquets, 48-52% Mo f.o.b. Langeloth, Pa., per pound contained Mo	80¢
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per pound contained Mo	80¢
Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per pound of alloy. Add ¼¢ for spot sales	
Carload lots	14¢
Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per pound of alloy	
Carload, bulk	4.60¢
Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk	5.75¢
Ton lots	7.25¢
Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per pound.	
Car lots	8.00¢
Ton lots	8.75¢
Less ton lots	9.25¢



... and Machining

MEANS LOWER FINAL COST

On the battery of Positioners (*shown in part upper left*) Press Parts are being welded in multiple production—multiple in parts produced, multiple in welds per setting. Positioned welding is flat or down hand welding—fast and productive of sound welds. On a battery of Horizontal Boring Bars (*shown in part lower left and above*), other parts of the same production order are being machined. These machines are equipped with both horizontal and vertical revolving tables—so that innumerable combinations of boring—internal and external milling, reaming, facing and turning are completed at one setup. That means speed in production and low cost. Here are facilities that performed without a break in scheduled production for the U. S. Navy for three years . . . now available to industry for **Welding and Machining to *Precision Standards in Quantity Production.***

We would like to meet with you in your plant or ours or send us your blue prints.

DANLY MACHINE SPECIALTIES, INC. **2100 S. 52nd Ave., Chicago 50, Ill.**

WELDED AND MACHINED AT *LOWER FINAL COST*

Prices and Production

(CONTINUED FROM PAGE 172)

Steel Ingot Production

Pct of Capacity

Source: American Iron and Steel Institute

	1927	1928	1929	1931	1932	1933
January	77.94	80.33	86.56	44.59	25.88	17.76
February	86.82	87.09	92.21	50.07	26.62	20.75
March	93.27	90.73	97.48	54.21	24.98	15.68
April	87.65	89.49	98.32	50.71	22.67	24.26
May	83.23	84.69	101.68	45.29	19.61	34.51
June	74.24	77.82	97.38	39.00	16.42	46.24
July	66.04	76.78	93.51	33.58	14.09	55.45
August	71.95	84.11	95.00	30.47	14.76	50.00
September	69.58	86.42	90.14	28.39	17.89	41.26
October	68.20	93.60	87.22	28.22	18.94	36.40
November	66.41	88.69	69.94	29.17	18.57	27.43
December	65.45	81.07	55.96	23.15	15.04	31.48
Average	75.83	85.05	88.76	37.99	19.67	33.52
	1934	1935	1936	1937	1938	1939
January	34.32	49.21	52.46	81.32	29.14	52.69
February	42.10	52.68	54.61	84.26	31.59	54.93
March	48.09	49.12	57.54	89.93	33.67	56.52
April	52.10	46.75	70.09	90.24	33.70	50.97
May	58.42	45.15	69.68	88.79	30.26	48.51
June	54.29	39.99	70.85	74.47	28.33	53.57
July	25.65	38.97	67.71	78.37	33.25	52.60
August	23.74	49.99	72.22	83.71	42.63	62.45
September	22.57	50.13	74.16	76.19	46.03	72.68
October	25.46	53.88	78.26	58.23	52.19	89.52
November	28.58	55.77	77.05	38.18	61.74	93.46
December	33.83	52.81	76.53	25.34	52.72	85.91
Average	37.37	48.68	68.45	72.33	39.60	64.53
	1940	1941	1942	1943	1944	1945
January	83.40	96.90	94.5	96.8	95.7	88.8
February	70.00	96.60	95.9	98.5	97.0	90.8
March	63.50	99.70	98.2	100.0	98.6	95.0
April	61.20	97.60	97.7	99.3	98.8	92.8
May	71.80	98.70	98.1	98.4	97.1	91.8
June	84.50	98.20	96.3	94.8	94.1	87.1
July	83.00	93.40	94.5	96.2	94.3	86.3
August	89.50	95.70	95.4	98.3	94.1	70.7
September	90.60	96.40	96.4	100.7	94.0	76.3
October	96.10	99.00	100.0	101.2	95.6	69.0
November	96.60	98.30	97.8	98.6	94.3	*79.5
December	94.10	98.10	96.6	94.2	92.6	*79.1
Average	82.10	97.40	96.8	98.1	95.5	85.0

* Preliminary figure, subject to revision.

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Composite Pig Iron Price

Average of THE IRON AGE quotations on basic pig iron at Valley furnaces and foundry iron at Chicago, Birmingham, Buffalo, Valley and Philadelphia, in gross tons.

	1926	1927	1928	1929	1930	1931
January	$21.79	$19.44	$17.63	$18.43	$18.19	$15.90
February	21.77	19.07	17.73	18.38	18.02	15.80
March	21.65	19.03	17.73	18.36	17.75	15.71
April	20.96	19.21	17.67	18.52	17.73	15.79
May	20.69	19.09	17.45	18.70	17.60	15.76
June	20.00	18.92	17.23	18.65	17.48	15.62
July	19.51	18.56	17.10	18.48	17.16	15.56
August	19.46	18.17	17.11	18.39	16.90	15.51
September	19.46	18.03	17.54	18.27	16.70	15.44
October	19.69	17.96	17.94	18.33	16.31	15.21
November	20.13	17.59	18.46	18.36	16.21	14.97
December	19.94	17.55	18.51	18.24	15.95	14.86
Average	20.42	18.55	17.68	18.43	17.17	15.51
	1932	1933	1934	1935	1936	1937
January	$14.68	$13.56	$16.90	$17.90	$18.84	$20.25
February	14.51	13.56	16.90	17.90	18.84	20.50
March	14.45	13.56	16.90	17.90	18.84	22.85
April	14.35	13.76	17.07	17.90	18.84	23.25
May	14.12	14.48	17.90	17.85	18.84	23.25
June	14.01	15.01	17.90	17.84	18.84	23.25
July	13.76	15.50	17.90	17.84	18.84	23.25
August	13.69	16.09	17.90	17.84	18.73	23.25
September	13.64	16.71	17.90	17.84	18.73	23.25
October	13.63	16.61	17.90	17.87	18.73	23.25
November	13.59	16.61	17.90	18.84	18.98	23.25
December	13.56	16.90	17.90	18.84	19.73	23.25
Average	14.00	15.20	17.58	18.03	18.90	22.74
	1938	1939	1940	1941	1944	1945
January	$23.25	$20.61	$22.61	$23.45	1943	$23.61
February	23.25	20.61	22.61	23.45	1942	23.86
March	23.25	20.61	22.61	23.53	price	24.61
April	23.25	20.61	22.61	23.61	fixed	24.61
May	23.25	20.61	22.61	23.61	at	24.61
June	22.98	20.61	22.61	23.61	$23.61	24.61
July	19.61	20.61	22.61	23.61		24.61
August	19.61	20.61	22.61	23.61		24.61
September	19.82	21.61	22.61	23.61		24.61
October	20.57	22.61	22.61	23.61		24.80
November	20.61	22.61	22.61	23.61		25.37
December	20.61	22.61	22.95	23.61		25.37
Average	21.67	21.19	22.64	23.58		24.61

Lake Superior Iron Ores,

(per gross ton, at Lake Erie ports)

Bessemer Ores

	Guarantee		Price	
	Iron Natural	Phosphorus Dry	Old Range	Mesabi
1914	55.00	0.045	$3.75	$3.50
1915	55.00	0.045	3.75	3.45
1916	55.00	0.045	4.45	4.20
1917	55.00	0.045	5.95	5.70
1918 to July 1	55.00	0.045	5.95	5.70
1918–July 1 to Sept. 30	55.00	0.045	6.40	6.15
1918–Oct. 1 on	55.00	0.045	6.65	6.40
1919	55.00	0.045	6.45	6.20
1920	55.00	0.045	7.45	7.20
1921	55.00	0.045	6.45	6.20
1922	55.00	0.045	5.95	5.70
1923	55.00	0.045	6.45	6.20
1924	55.00	0.045	4.65	5.40
1925 through 1928	51.50	0.045	4.55	4.40
1929 through 1936	51.50	0.045	4.80	4.65
1937 to Apr. 15, 1940	51.50	0.045	5.25	5.10
1940–Apr. 16 on	51.50	0.045	4.75	4.80
1941 through 1945	51.50	0.045	4.75	4.60

Non-bessemer Ores

	Guarantee	Price		
	Iron Natural	Old Range	Mesabi	High Phosphorus
1914	51.50	$3.00	$2.85	....
1915	51.50	3.00	2.80	....
1916	51.50	3.70	3.55	....
1917	51.50	5.20	5.05	....
1918 to July 1	51.50	5.20	5.05	....
1918–July 1 to Sept. 30	51.50	5.65	5.50	....
1918–Oct. 1 on	51.50	5.90	5.75	....
1919	51.50	5.70	5.55	$5.35
1920	51.50	6.70	6.55	6.35
1921	51.50	5.70	5.55	5.35
1922	51.50	5.20	5.05	4.85
1923	51.50	5.70	5.55	5.35
1924	51.50	4.90	4.75	4.55
1925 through 1928	51.50	4.40	4.25	4.15
1929 through 1933	51.50	4.65	4.50	4.40
1937 to Apr. 15, 1940	51.50	5.10	4.95	4.85
1940—Apr. 16 on	51.50	4.60	4.45	4.35
1941 through 1945	51.50	4.60	4.45	4.35

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Lake Superior Iron Ore Shipments

(water movement, grass tons)

1929	1932	1933	1934
65,204,600	3,567,985	21,623,898	22,249,600
1935	1936	1937	1938
28,362,368	44,822,023	62,598,836	19,263,011
1939	1940	1941	1942
45,072,725	63,712,982	80,116,360	92,028,325
1943	1944	1945	
94,533,434	80,358,890	75,714,750	

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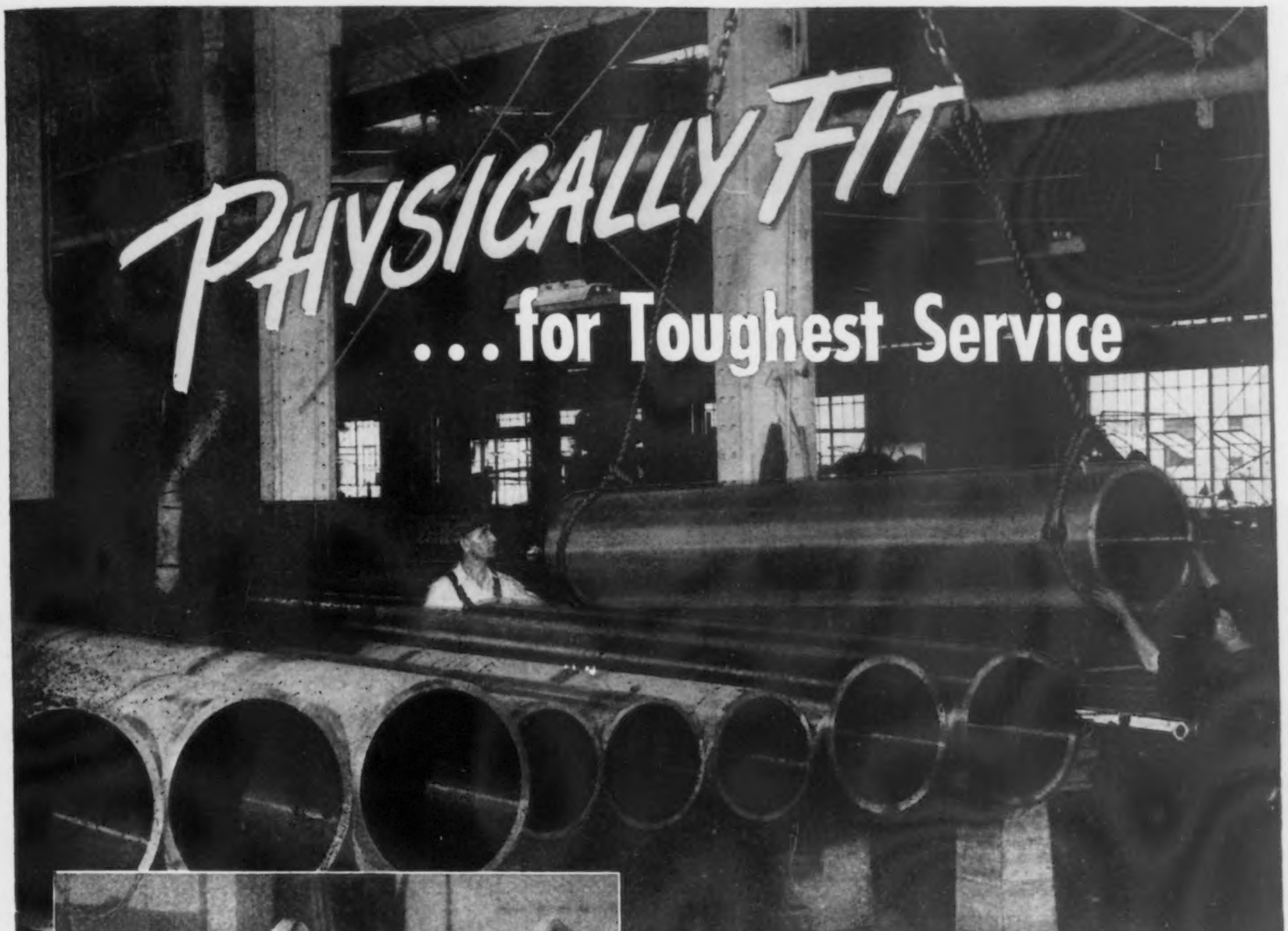
Ferromanganese, 80 Pct

(carloads, per gross ton, at seaboard)

	1932	1933	1934	1935	1936	1937
January	$75.00	$68.00	$85.00	$85.00	$75.00	$80.00
February	75.00	68.00	85.00	85.00	75.00	80.00
March	75.00	68.00	85.00	85.00	75.00	89.00
April	75.00	68.00	85.00	85.00	75.00	95.00
May	75.00	68.00	85.00	85.00	75.00	100.62
June	68.00	82.00	85.00	85.00	75.00	102.50
July	68.00	82.00	85.00	85.00	75.00	102.50
August	68.00	82.00	85.00	85.00	75.00	102.50
September	68.00	82.00	85.00	85.00	75.00	102.50
October	68.00	82.00	85.00	85.00	75.00	102.50
November	68.00	82.00	85.00	85.00	80.00	102.50
December	68.00	82.00	85.00	85.00	80.00	102.50
Average	70.92	75.00	85.00	85.00	75.83	96.84
	1938	1939	1940	1941	1942	1945
January	$102.50	$85.00	$100.00	$120.00	$120.00	1944
February	102.50	80.00	100.00	120.00	120.00	1943
March	102.50	80.00	100.00	120.00	120.00	price
April	102.50	80.00	100.00	120.00	120.00	fixed
May	102.50	80.00	100.00	120.00	135.00	at
June	102.50	80.00	110.00	120.00	135.00	$135.00
July	92.50	80.00	120.00	120.00	135.00	
August	92.50	80.00	120.00	120.00	135.00	
September	92.50	95.00	120.00	120.00	135.00	
October	92.50	100.00	120.00	120.00	135.00	
November	92.50	100.00	120.00	120.00	135.00	
December	92.50	100.00	120.00	120.00	135.00	
Average	97.50	86.67	110.84	120.00	130.00	

(CONTINUED ON PAGE 228)



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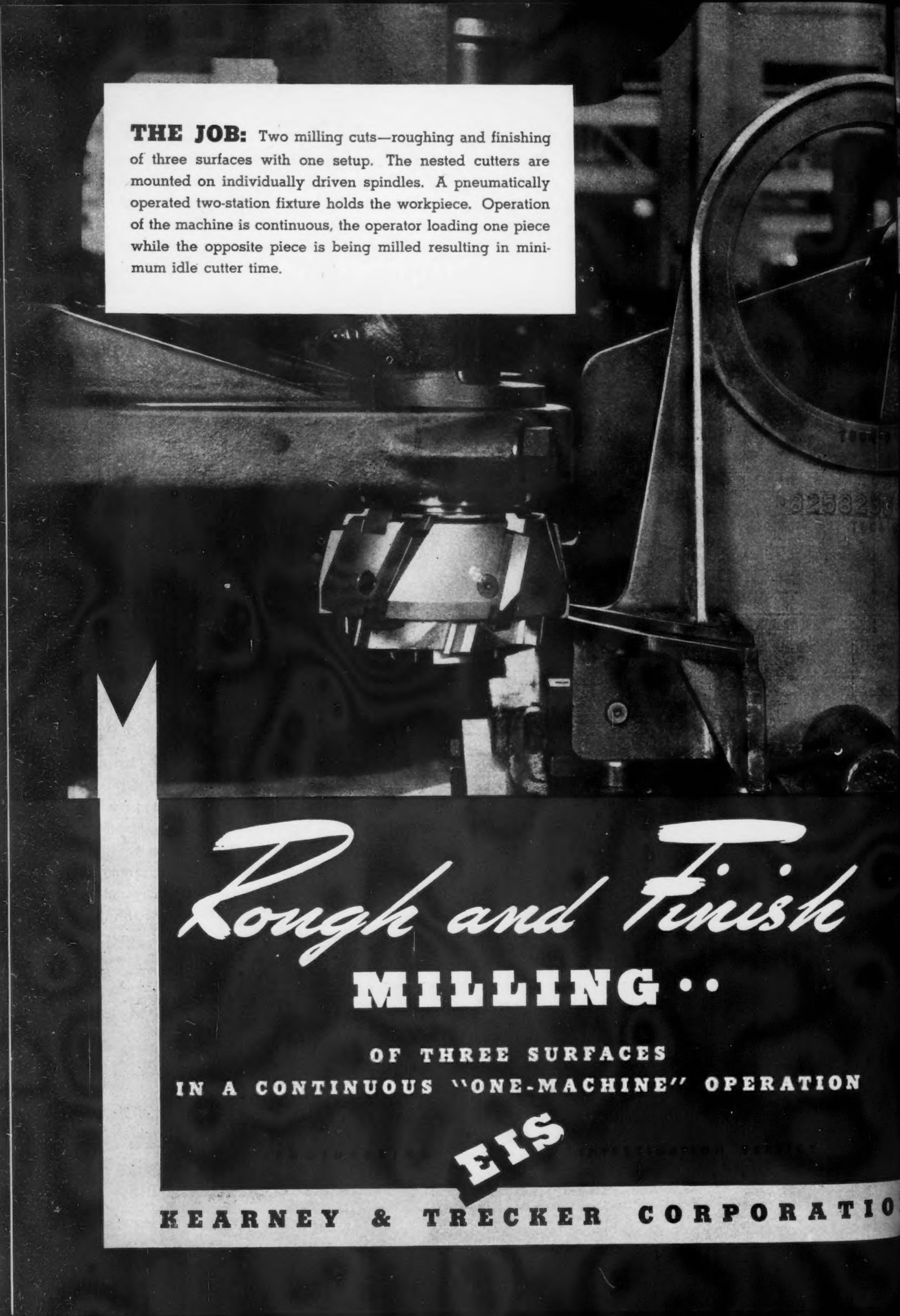

THE JOB: Two milling cuts—roughing and finishing of three surfaces with one setup. The nested cutters are mounted on individually driven spindles. A pneumatically operated two-station fixture holds the workpiece. Operation of the machine is continuous, the operator loading one piece while the opposite piece is being milled resulting in minimum idle cutter time.
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MILLING ..
OF THREE SURFACES
IN A CONTINUOUS "ONE-MACHINE" OPERATION
EIS
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STATISTICAL

Merchant Bars at Pittsburgh
(cents per pound)

	1930	1931	1932	1933	1934	1935
January	1.89	1.64	1.50	1.60	1.75	1.80
February	1.85	1.65	1.50	1.60	1.75	1.80
March	1.85	1.65	1.52	1.60	1.75	1.80
April	1.79	1.65	1.60	1.60	1.79	1.80
May	1.75	1.65	1.60	1.60	1.90	1.80
June	1.73	1.65	1.60	1.60	1.90	1.80
July	1.65	1.63	1.60	1.60	1.82	1.80
August	1.64	1.60	1.60	1.60	1.80	1.80
September	1.61	1.60	1.60	1.60	1.80	1.80
October	1.60	1.60	1.60	1.75	1.80	1.85
November	1.60	1.60	1.60	1.75	1.80	1.85
December	1.60	1.58	1.60	1.75	1.80	1.85
Average	1.71	1.63	1.57	1.64	1.81	1.81

	1936	1937	1938	1939	1944	1945
January	1.85	2.20	2.45	2.25	1943	2.15
February	1.85	2.20	2.45	2.25	1942	2.15
March	1.85	2.40	2.45	2.25	1941	2.15
April	1.85	2.45	2.45	2.25	1940	2.15
May	1.85	2.45	2.45	2.19	price	2.17
June	1.85	2.45	2.41	2.15	fixed	2.25
July	1.95	2.45	2.25	2.15	at	2.25
August	1.95	2.45	2.25	2.15	2.15	2.25
September	1.97	2.45	2.25	2.15		2.25
October	2.05	2.45	2.25	2.15		2.25
November	2.05	2.45	2.25	2.15		2.25
December	2.05	2.45	2.25	2.15		2.25
Average	1.93	2.40	2.35	2.19		2.21

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Cold-Finished Steel Bars at Pittsburgh
(cents per pound)

	1930	1931	1932	1933	1934	1935
January	2.15	2.08	2.00	1.70	2.10	2.10
February	2.10	2.10	2.00	1.70	2.10	2.10
March	2.10	2.10	2.00	1.70	2.10	2.10
April	2.10	2.10	2.00	1.70	2.10	2.01
May	2.10	2.10	1.82	1.70	2.10	1.95
June	2.10	2.10	1.70	1.70	2.10	1.95
July	2.10	2.10	1.70	1.70	2.10	1.95
August	2.10	2.10	1.70	1.70	2.10	1.95
September	2.10	2.10	1.70	1.95	2.10	1.95
October	2.10	2.10	1.70	1.95	2.10	1.95
November	2.00	2.10	1.70	1.95	2.10	1.95
December	2.00	2.02	1.70	2.10	2.10	1.95
Average	2.09	2.09	1.81	1.80	2.10	1.99

	1936	1937	1938	1939	1944	1945
January	2.10	2.55	2.90	2.70	1943	2.65
February	2.10	2.55	2.90	2.70	1942	2.65
March	2.10	2.83	2.90	2.70	1941	2.65
April	2.10	2.90	2.90	2.70	1940	2.65
May	2.10	2.90	2.90	2.68	price	2.65
June	2.10	2.90	2.70	2.65	fixed	2.65
July	2.25	2.90	2.70	2.65	at	2.65
August	2.25	2.90	2.70	2.65	2.65	2.73
September	2.25	2.90	2.70	2.65		2.75
October	2.35	2.90	2.70	2.65		2.75
November	2.35	2.90	2.70	2.65		2.75
December	2.35	2.90	2.70	2.65		2.75
Average	2.20	2.84	2.78	2.67		2.69

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Structural Shapes at Pittsburgh
(cents per pound)

	1928	1929	1930	1931	1932	1933
January	1.81	1.90	1.83	1.64	1.50	1.60
February	1.85	1.90	1.80	1.65	1.50	1.60
March	1.85	1.90	1.80	1.65	1.52	1.60
April	1.85	1.95	1.80	1.65	1.60	1.60
May	1.85	1.95	1.73	1.65	1.60	1.60
June	1.85	1.95	1.69	1.65	1.60	1.60
July	1.85	1.95	1.65	1.63	1.60	1.60
August	1.90	1.95	1.61	1.60	1.60	1.60
September	1.90	1.95	1.60	1.60	1.60	1.60
October	1.90	1.90	1.60	1.60	1.60	1.70
November	1.90	1.90	1.60	1.60	1.60	1.70
December	1.90	1.90	1.60	1.50	1.60	1.70
Average	1.87	1.92	1.69	1.62	1.57	1.68

	1934	1935	1936	1937	1938	1945
January	1.70	1.80	1.80	2.05	2.25	1944
February	1.70	1.80	1.80	2.05	2.25	1943
March	1.70	1.80	1.80	2.21	2.25	1942
April	1.74	1.80	1.80	2.25	2.25	1941
May	1.85	1.80	1.80	2.25	2.25	1940
June	1.85	1.80	1.80	2.25	2.22	1939
July	1.81	1.80	1.90	2.25	2.10	price
August	1.80	1.80	1.90	2.25	2.10	fixed
September	1.80	1.80	1.90	2.25	2.10	at
October	1.80	1.80	1.90	2.25	2.10	2.10
November	1.80	1.80	1.90	2.25	2.10	
December	1.80	1.80	1.90	2.25	2.10	
Average	1.78	1.80	1.85	2.21	2.17	

Cold-Rolled Sheets at Pittsburgh

(cents per pound)

	1929	1931	1932	1933	1934	1935
January	4.10	3.30	2.90	2.35	2.75	2.95
February	4.10	3.90	2.80	2.25	2.75	2.95
March	4.10	3.24	2.86	2.30	2.75	2.95
April	4.10	3.10	2.90	2.30	2.85	2.95
May	4.10	3.03	2.89	2.34	3.15	2.95
June	4.10	3.02	2.85	2.29	3.15	2.95
July	4.10	3.10	2.85	2.40	2.99	2.95
August	4.08	3.10	2.81	2.47	2.95	2.95
September	4.00	3.10	2.75	2.75	2.95	2.95
October	4.00	3.10	2.65	2.75	2.95	2.95
November	4.00	3.10	2.63	2.75	2.95	2.95
December	3.98	3.02	2.65	2.75	2.95	2.95
Average	4.06	3.13	2.80	2.48	2.96	2.95

	1936	1937	1938	1939	1940	1945
January	2.95	3.25	3.55	3.20	3.05	1944
February	2.95	3.25	3.50	3.20	3.05	1943
March	2.95	3.49	3.45	3.20	3.05	1942
April	2.95	3.55	3.45	3.20	2.93	1941
May	2.95	3.55	3.43	3.11	3.05	price
June	2.95	3.55	3.32	3.05	3.05	fixed
July	3.05	3.55	3.20	3.05	3.05	at
August	3.05	3.55	3.20	3.05	3.05	3.05
September	3.05	3.55	3.20	3.05	3.05	
October	3.05	3.55	3.08	3.05	3.05	
November	3.05	3.55	3.20	3.05	3.05	
December	3.25	3.55	3.20	3.05	3.05	
Average	3.02	3.49	3.31	3.10	3.04	

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Hot-Rolled Sheets at Pittsburgh

(cents per pound)

	1931	1932	1933	1934	1935	1936
January	1.90	1.75	1.62	1.75	1.85	1.85
February	1.90	1.75	1.60	1.75	1.85	1.85
March	1.90	1.71	1.55	1.75	1.85	1.85
April	1.85	1.70	1.55	1.81	1.85	1.85
May	1.85	1.70	1.44	2.00	1.85	1.85
June	1.85	1.70	1.50	2.00	1.85	1.87
July	1.85	1.70	1.65	1.88	1.85	1.95
August	1.85	1.70	1.65	1.85	1.85	1.95
September	1.85	1.70	1.68	1.85	1.85	1.95
October	1.85	1.70	1.75	1.85	1.85	1.95
November	1.85	1.70	1.75	1.85	1.85	1.95
December	1.80	1.70	1.75	1.85	1.85	2.15
Average	1.86	1.71	1.62	1.85	1.85	1.92

	1937	1938	1939	1940	1944	1945
January	2.15	2.40	2.15	2.10	1943	2.10
February	2.15	2.40	2.15	2.10	1942	2.10
March	2.35	2.40	2.15	2.10	1941	2.18
April	2.40	2.40	2.15	2.10	price	2.20
May	2.40	2.38	2.06	1.98	fixed	2.20
June	2.40	2.27	2.00	2.10	at	2.20
July	2.40	2.15	2.00	2.10	2.10	2.20
August	2.40	2.15	2.00	2.10		2.20
September	2.40	2.15	2.00	2.10		2.20
October	2.40	2.03	2.00	2.10		2.20
November	2.40	2.15	2.02	2.10		2.20
December	2.40	2.15	2.10	2.10		2.20
Average	2.35	2.25	2.06	2.09		2.18

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No. 24 Gage Galvanized Sheets at Pittsburgh

(cents per pound)

	1929	1930	1931	1932	1933	1934
January	3.60	3.33	2.90	2.80	2.68	2.85
February	3.60	3.30	2.90	2.75	2.50	2.85
March	3.60	3.30	2.90	2.85	2.60	2.85
April	3.60	3.30	2.84	2.85	2.63	2.95
May	3.60	3.23	2.80	2.85	2.70	3.25
June	3.60	3.19	2.74	2.85	2.70	3.25
July	3.60	3.13	2.90	2.85	2.85	3.13
August	3.50	3.05	2.90	2.81	2.85	3.10
September	3.50	3.00	2.90	2.75	2.85	3.10
October	3.50	2.99	2.90	2.85	2.85	3.10
November	3.48	2.95	2.90	2.85	2.85	3.10
December	3.40	2.92	2.86	2.85	2.85	3.10
Average	3.55	3.14	2.87	2.83	2.74	3.05

	1935	1936	1937	1938	1944	1945
January	3.10	3.10	3.40	3.80	1943	3.50
February	3.10	3.10	3.40	3.80	1942	3.50
March	3.10	3.10	3.72	3.80	1941	3.62
April	3.10	3.10	3.80	3.80	1940	3.65
May	3.10	3.10	3.80	3.80	1939	3.66
June	3.10	3.10	3.80	3.68	price	3.70
July	3.10	3.20	3.80	3.50	fixed	3.70
August	3.10	3.20	3.80	3.50	at	3.70
September	3.10	3.20	3.80	3.50	3.50	3.70
October	3.10	3.20	3.80	3.45		3.70
November	3.10	3.20	3.80	3.50		3.70
December	3.10	3.40	3.80	3.50		3.70
Average	3.10	3.17	3.73	3.64		3.65

Hot-Rolled Strip at Pittsburgh

(cents per pound)

	1929	1931	1932	1933	1934	1935
January	1.80	1.55	1.41	1.45	1.75	1.85
February	1.80	1.55	1.40	1.45	1.75	1.85
March	1.80	1.55	1.40	1.45	1.75	1.85
April	1.90	1.55	1.40	1.45	1.81	1.85
May	1.90	1.55	1.40	1.49	2.00	1.85
June	1.90	1.55	1.41	1.55	2.00	1.85
July	1.90	1.55	1.45	1.60	1.88	1.85
August	1.90	1.55	1.45	1.64	1.85	1.85
September	1.97	1.55	1.45	1.68	1.85	1.85
October	1.90	1.54	1.45	1.75	1.85	1.85
November	1.90	1.50	1.45	1.75	1.85	1.85
December	1.90	1.49	1.45	1.75	1.85	1.85
Average	1.88	1.54	1.43	1.58	1.85	1.85

	1936	1937	1938	1939	1940	1945
January	1.85	2.15	2.40	2.15	2.10	1944
February	1.85	2.15	2.40	2.15	2.10	1943
March	1.85	2.35	2.40	2.15	2.10	1942
April	1.85	2.40	2.40	2.15	1.98	1941
May	1.85	2.40	2.38	2.06	2.10	price
June	1.85	2.40	2.27	2.00	2.10	fixed
July	1.95	2.40	2.15	2.00	2.10	at
August	1.95	2.40	2.15	2.00	2.10	2.10
September	1.95	2.40	2.15	2.00	2.10	
October	1.95	2.40	2.03	2.00	2.10	
November	1.95	2.40	2.15	2.02	2.10	
December	2.11	2.40	2.15	2.10	2.10	
Average	1.91	2.35	2.25	2.06	2.09	

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Cold-Rolled Strip at Pittsburgh

(cents per pound)

	1929	1931	1932	1933	1934	1935
January	2.85	2.25	1.92	1.88	2.40	2.60
February	2.85	2.25	1.90	1.80	2.40	2.60
March	2.80	2.25	1.96	1.80	2.40	2.60
April	2.75	2.23	2.00	1.80	2.50	2.60
May	2.75	2.15	2.00	1.88	2.80	2.60
June	2.75	2.15	2.00	2.00	2.80	2.60
July	2.75	2.15	2.00	2.19	2.64	2.60
August	2.75	2.15	2.00	2.25	2.60	2.60
September	2.75	2.15	1.92	2.29	2.60	2.60
October	2.75	2.13	1.90	2.40	2.60	2.60
November	2.75	2.05	2.00	2.40	2.60	2.60
December	2.75	2.03	2.00	2.40	2.60	2.60
Average	2.77	2.16	1.97	2.09	2.58	2.60

	1936	1937	1938	1939	1940	1945
January	2.60	2.85	3.20	2.95	2.80	1944
February	2.60	2.85	3.20	2.95	2.80	1943
March	2.60	3.13	3.20	2.95	2.80	1942
April	2.60	3.20	3.20	2.95	2.68	1941
May	2.60	3.20	3.18	2.86	2.80	price
June	2.60	3.20	3.07	2.80	2.80	fixed
July	2.60	3.20	2.95	2.80	2.80	at
August	2.60	3.20	2.95	2.80	2.80	2.80
September	2.60	3.20	2.95	2.80	2.80	
October	2.60	3.20	2.83	2.80	2.80	
November	2.60	3.20	2.95	2.80	2.80	
December	2.80	3.20	2.95	2.80	2.80	
Average	2.62	3.14	3.05	2.86	2.79	

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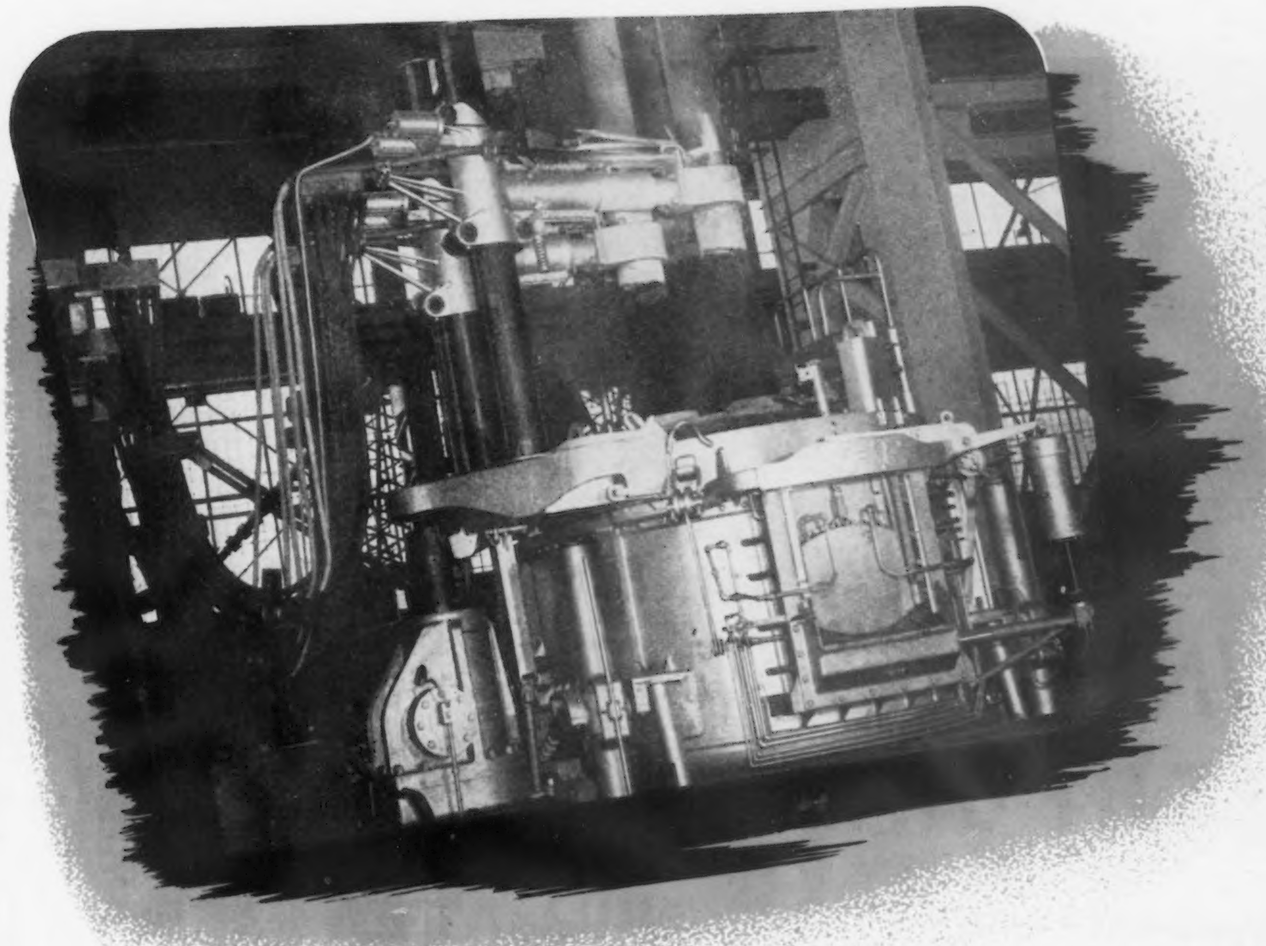
Plates at Pittsburgh

(cents per pound)

	1929	1930	1931	1932	1933	1934
January	1.90	1.83	1.64	1.50	1.60	1.70
February	1.90	1.80	1.65	1.50	1.60	1.70
March	1.90	1.80	1.65	1.52	1.60	1.70
April	1.95	1.80	1.65	1.60	1.55	1.74
May	1.95	1.73	1.65	1.60	1.50	1.85
June	1.95	1.69	1.65	1.60	1.53	1.85
July	1.95	1.65	1.63	1.60	1.60	1.81
August	1.95	1.61	1.60	1.60	1.60	1.80
September	1.95	1.60	1.60	1.60	1.60	1.80
October	1.94	1.60	1.60	1.60	1.70	1.80
November	1.90	1.60	1.60	1.60	1.70	1.80
December	1.90	1.60	1.54	1.60	1.70	1.80
Average	1.93	1.69	1.62	1.57	1.61	1.78

	1935	1936	1937	1938	1944	1945
January	1.80	1.80	2.05	2.25	1943	2.10
February	1.80	1.80	2.05	2.25	1942	2.10
March	1.80	1.80	2.21	2.25	1941	2.18
April	1.80	1.80	2.25	2.25	1940	2.20
May	1.80	1.80	2.25	2.25	1939	2.21
June	1.80	1.80	2.25	2.22	price	2.25
July	1.80	1.90	2.25	2.10	fixed	2.25
August	1.80	1.90	2.25	2.10	at	2.25
September	1.80	1.90	2.25	2.10	2.10	2.25
October	1.80	1.90	2.25	2.10		2.25
November	1.80	1.90	2.25	2.10		2.25
December	1.80	1.90	2.25	2.10		2.25
Average	1.80	1.85	2.21	2.17		2.21



SIMPLICITY OF DESIGN, OPERATION, AND MAINTENANCE

ARE FUNDAMENTALS OF MOORE RAPID *Lectromelt* FURNACES

The Lectromelt Furnace is designed by skilled engineers and practical metallurgists on the basis of broad experience. Experience has taught that simplicity of design, operation, and maintenance are the fundamental qualities of a great electric furnace. In the Lectromelt design all complex operating mechanisms have been minimized. This means ease of operation and low maintenance costs. This attention to fundamentals has resulted in long efficient service with minimum maintenance which characterizes Lectromelt equipment.

You can also depend on Lectromelt not to overlook any opportunity for improvement that is . . . *Experience Proven.*

PITTSBURGH LECTROMELT FURNACE CORP.
PITTSBURGH 30, PA.

Steel Rails at Mill, Openhearth
(per gross ton)

	1929	1930	1931	1932	1933	1934
January	$43.00	$43.00	$43.00	$43.00	$40.00	$36.37
February	43.00	43.00	43.00	43.00	40.00	36.37
March	43.00	43.00	43.00	43.00	40.00	36.37
April	43.00	43.00	43.00	43.00	40.00	36.37
May	43.00	43.00	43.00	43.00	40.00	36.37
June	43.00	43.00	43.00	43.00	40.00	36.37
July	43.00	43.00	43.00	43.00	40.00	36.37
August	43.00	43.00	43.00	43.00	40.00	36.37
September	43.00	43.00	43.00	43.00	40.00	36.37
October	43.00	43.00	43.00	42.25	39.55	36.37
November	43.00	43.00	43.00	40.00	36.38	36.37
December	43.00	43.00	43.00	40.00	36.38	36.37
Average	43.00	43.00	43.00	42.44	39.26	36.37

	1935	1936	1937	1938	1944	1945
January	$36.37	$36.37	$39.00	$42.50	1943	$40.00
February	36.37	36.37	39.00	42.50	1942	40.00
March	36.37	36.37	41.80	42.50	1941	42.25
April	36.37	36.37	42.50	42.50	1940	43.00
May	36.37	36.37	42.50	42.50	1939	43.00
June	36.37	36.37	42.50	42.50	price	43.00
July	36.37	36.37	42.50	42.50	fixed	43.00
August	36.37	36.37	42.50	42.50	at	43.00
September	36.37	36.37	42.50	41.25	$40.00	43.00
October	36.37	36.37	42.50	40.00		43.00
November	36.37	36.37	42.50	40.00		43.00
December	36.37	39.00	42.50	40.00		43.00
Average	36.37	36.59	41.86	41.77		42.44

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Tinplate at Pittsburgh
(per base box)

	1928	1929	1930	1931	1932	1933
January	$5.25	$5.35	$5.25	$5.00	$4.75	$4.25
February	5.25	5.35	5.25	5.00	4.75	4.25
March	5.25	5.35	5.25	5.00	4.75	4.25
April	5.25	5.35	5.25	5.00	4.75	4.25
May	5.25	5.35	5.25	5.00	4.75	4.25
June	5.25	5.35	5.25	5.00	4.75	4.25
July	5.25	5.35	5.25	5.00	4.75	4.25
August	5.25	5.35	5.25	5.00	4.75	4.25
September	5.25	5.35	5.25	5.00	4.75	4.65
October	5.25	5.35	5.00	4.75	4.75	4.65
November	5.25	5.35	5.00	4.75	4.55	4.65
December	5.25	5.35	5.00	4.75	4.25	5.25
Average	5.25	5.35	5.19	4.94	4.69	4.43

	1934	1935	1936	1937	1938	1945
January	$5.25	$5.25	$5.25	$4.85	$5.35	1944
February	5.25	5.25	5.25	4.85	5.35	1943
March	5.25	5.25	5.25	4.85	5.35	1942
April	5.25	5.25	5.25	5.35	5.35	1941
May	5.25	5.25	5.25	5.35	5.35	1940
June	5.25	5.25	5.25	5.35	5.35	1939
July	5.25	5.25	5.25	5.35	5.35	price
August	5.25	5.25	5.25	5.35	5.35	fixed
September	5.25	5.25	5.25	5.35	5.35	at
October	5.25	5.25	5.25	5.35	5.35	$5.00
November	5.25	5.25	5.25	5.35	5.18	
December	5.25	5.25	5.25	5.35	5.00	
Average	5.25	5.25	5.25	5.22	5.31	

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Bright Wire at Pittsburgh,
(cents per pound)

	1929	1930	1931	1932	1933	1934
January	2.50	2.40	2.20	2.20	2.16	2.20
February	2.50	2.40	2.20	2.20	2.10	2.20
March	2.50	2.40	2.20	2.20	2.10	2.20
April	2.50	2.38	2.20	2.20	2.10	2.23
May	2.50	2.30	2.20	2.20	2.10	2.30
June	2.50	2.30	2.20	2.20	2.10	2.30
July	2.50	2.30	2.20	2.20	2.10	2.30
August	2.43	2.30	2.20	2.20	2.10	2.30
September	2.40	2.30	2.20	2.20	2.10	2.30
October	2.40	2.30	2.20	2.20	2.10	2.30
November	2.40	2.30	2.20	2.20	2.10	2.30
December	2.40	2.22	2.20	2.20	2.20	2.30
Average	2.46	2.33	2.20	2.20	2.11	2.27

	1935	1936	1937	1938	1944	1945
January	2.30	2.30	2.60	2.90	1943	2.60
February	2.30	2.30	2.60	2.90	1942	2.60
March	2.30	2.30	2.84	2.90	1941	2.60
April	2.30	2.40	2.90	2.90	1940	2.60
May	2.30	2.40	2.90	2.90	1939	2.63
June	2.30	2.40	2.90	2.84	price	2.75
July	2.30	2.40	2.90	2.60	fixed	2.75
August	2.30	2.40	2.90	2.60	at	2.75
September	2.30	2.40	2.90	2.60	2.60	2.75
October	2.30	2.50	2.90	2.60		2.75
November	2.30	2.50	2.90	2.60		2.75
December	2.30	2.60	2.90	2.60		2.75
Average	2.30	2.41	2.84	2.74		2.69

Standard Steel Pipe at Pittsburgh

(per net ton)

Computed from list discounts, for carload lots; price for base size pipe, 1 to 3 in.; ¾ to 3 in. prior to April 13, 1931.

	1928	1929	1930	1931	1932	1933
January	$68.60	$70.30	$70.30	$66.50	$64.84	$65.00
February	68.60	70.30	70.30	66.50	64.84	65.00
March	68.60	70.30	70.30	66.50	64.84	65.00
April	69.88	70.30	66.50	66.50	64.84	58.00
May	70.30	70.30	66.50	63.59	64.84	58.00
June	70.30	70.30	66.50	64.84	64.84	58.00
July	70.30	70.30	66.50	64.84	64.84	61.75
August	70.30	70.30	66.50	64.84	64.84	61.75
September	70.30	70.30	66.50	64.84	65.00	61.75
October	70.30	70.30	66.50	64.84	65.00	91.75
November	70.30	70.30	66.50	64.84	65.00	61.75
December	70.30	70.30	66.50	64.84	65.00	61.75
Average	69.84	70.30	67.45	65.29	64.89	61.63

	1934	1935	1936	1937	1938	1945
January	$61.75	$68.40	$68.40	$61.00	$71.00	1944
February	61.75	68.40	64.98	61.00	71.00	1943
March	61.75	68.40	61.80	69.00	71.00	1942
April	63.41	68.40	61.00	71.00	71.00	1941
May	68.40	68.40	61.00	71.00	71.00	1940
June	68.40	68.40	61.00	71.00	71.00	1939
July	68.40	68.40	61.00	71.00	63.00	price
August	68.40	68.40	61.00	71.00	63.00	fixed
September	68.40	68.40	61.00	71.00	63.00	at
October	68.40	68.40	61.00	71.00	63.00	$63.00
November	68.40	68.40	61.00	71.00	63.00	
December	68.40	68.40	61.00	71.00	63.00	
Average	66.32	68.40	62.01	69.17	67.00	

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High Speed Tool Steel

(cents per pound)

	1937	1945
January	80.00	1944
February	67.00	1943
March	67.00	1942
April	67.00	1941
May	67.00	1940
June	67.00	1939
July	67.00	1938
August	67.00	price
September	80.00	fixed
October	80.00	at
November	80.00	67.00
December	80.00	
Average	70.10	

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Stainless Steel Sheets, No. 304

(cents per pound)

	1937	1945
January	35.00	1944
February	35.00	1943
March	36.00	1942
April	36.00	1941
May	36.00	1940
June	36.00	1939
July	36.00	1938
August	36.00	price
September	36.00	fixed
October	36.00	at
November	36.00	36.00
December	36.00	
Average	35.90	

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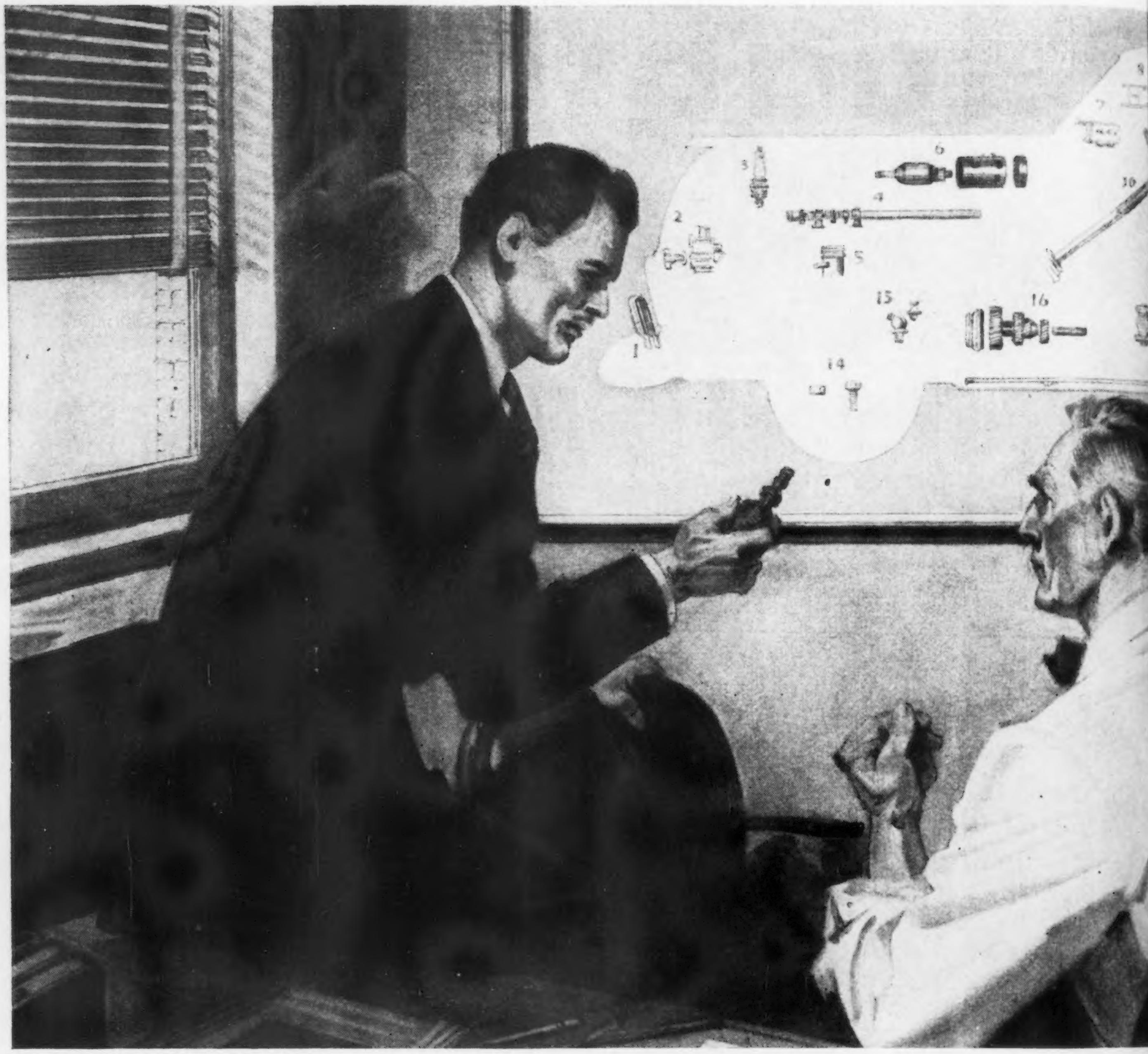
Basic Pig Iron at Mahoning or Shenango Valley Furnaces

(per gross ton)

	1937	1938	1939	1940	1944	1945
January	$20.50	$23.50	$20.50	$22.50	1943	$23.50
February	20.75	23.50	20.50	22.50	1942	23.75
March	23.10	23.50	20.50	22.50	1941	24.50
April	23.50	23.50	20.50	22.50	price	24.50
May	23.50	23.50	20.50	22.50	fixed	24.50
June	23.50	22.70	20.50	22.50	at	24.50
July	23.50	19.50	20.50	22.50	$23.50	24.50
August	23.50	19.50	20.50	22.50		24.50
September	23.50	19.75	21.50	22.50		24.50
October	23.50	20.50	22.50	22.50		24.69
November	23.50	20.50	22.50	22.50		25.25
December	23.50	20.50	22.50	22.90		25.25
Average	22.99	21.70	21.09	22.53		24.50

(CONTINUED ON PAGE 240)



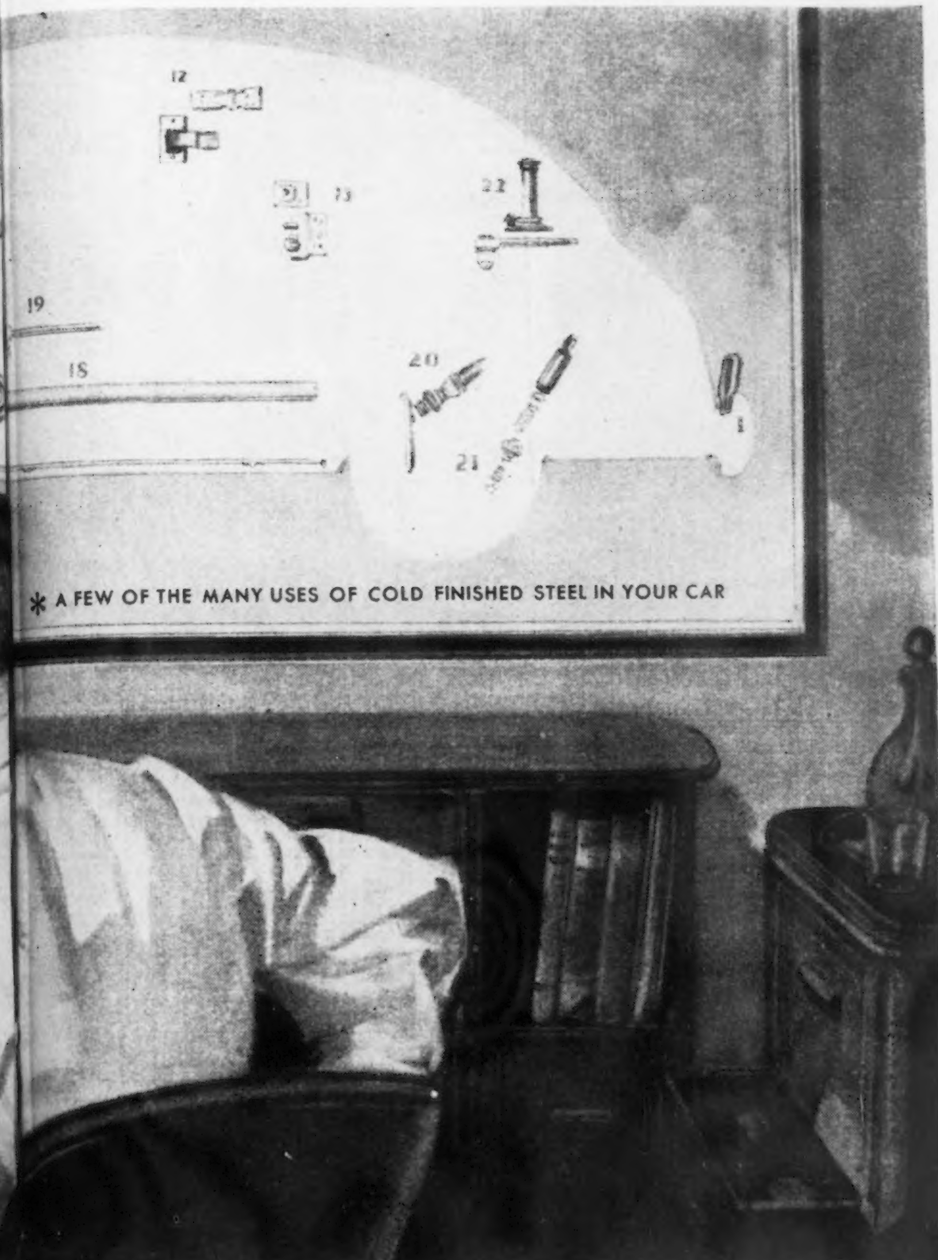
DRAWN FOR JONES & LAUGHLIN STEEL CORPORATION BY ORISON MAC PHERSON

FOR EASILY MACHINED, ACCURATE PARTS USE—
J&L COLD FINISHED STEEL

Your automobile is principally a product of steel—a family of steels made and finished in a variety of ways for the part each plays in giving you safe, fast, economical, dependable transportation.

Some parts are pressed. Others are forged. A great many stem from cold finished steel bars and shapes. Cold finishing of steel was discovered and developed at J&L. To this experience of the years has been added the quickening of research and production that the war demanded. Out of this now come new techniques and methods that promise profitable application in the peacetime manufacture of automobiles—of all manner of machines and equipment where strong, durable parts are needed.

The production of cold finished steel at J&L is integrated from raw materials to the hard, shining bars, the rounds, flats, hexagons and special shapes. Every step is controlled for quality. It is steel made to do the job, be it a gear in the water pump, the hard-working drive shaft or the special shapes that form the door hinges.



* A few of the many uses of Cold Finished Steel in your car:

1. *Bumper guards—made from special shapes or ground bars.*
2. *Water-pump gear assembly.*
3. *Spark-plug parts.*
4. *Cold drawn tubing for rocker-arm shafts.*
5. *Piston pins.*
6. *Generator parts and shafts.*
7. *Control shafts on dashboard radios.*
8. *Speedometer gears.*
9. *J&L special precision ground stock for dashboard clock parts.*
10. *Steering column from cold drawn tubing.*
11. *Steering wheel hubs machined from cold drawn bars.*
12. *Door hinges from special shapes.*
13. *Door-lock and striker parts from special sections.*
14. *Nuts made from hexagon and special sections.*
15. *Grease and lubrication cups from cold drawn hexagons.*
16. *Transmission ring-gears made from special sections.*
17. *Running board treads molded in molds machined from cold rolled flats.*
18. *Drive shaft.*
19. *Seat adjuster rods.*
20. *Hydraulic brake connections and parts.*
21. *Shock-absorber parts.*
22. *Socket wrenches and jack (in tool kit).*

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

J&L STEEL

LIGHTER, STRONGER, CONTROLLED QUALITY STEELS

(Advertisement)

STEEL FOR MACHINES

Discouragement to autos was considered duty of many American municipalities when "horseless carriage" first appeared on streets, terrifying pedestrians. Ordinances put anti-speed humps in paving, forbade sale of gasoline, required drivers to send flagman ahead, compelled operators of steam propelled autos to become licensed engineers. Can you recall other similar restrictions?

1,500 makes of cars and trucks have been on market. How many do you remember?

Spark plugs in 1902 on Cadillac car were advertised as big feature because they could be taken off for cleaning "with the greatest of facility." Even then, as now, J&L cold finished steel was popular for spark plug shells.

Machines that make machines are called machine tools. They use cold finished steels in huge quantities to make other machinery and equipment and are themselves made of cold finished steel.

Organized in 1904, the SAE (Society of Automotive Engineers) brought about standardization of specifications that aided rapid development of motor cars.

Partial fabrication of parts is offered by special cold finished shapes in which J&L specializes, resulting not only in material and cost saving but in better physicals.

Before steel, machinery was laboriously, often clumsily, handmade of iron or even wood. The marvels of the present machine-tool age became possible when steel in abundance was made available in America about half a century ago.

Design engineers like new steels that are lighter, stronger, more workable and give them opportunities to re-design machines and equipment for greater usefulness at lower cost with less weight.

Gold medal for Jalcase Steel was awarded J&L at the Philadelphia Sesqui-Centennial Exposition. This grade was later adopted by SAE.

Bequests of iron nails, along with jewels, are found in wills of wealthy American Colonists because England forbade the Colonies to manufacture articles of iron.

Measuring to 5/10,000 of an inch with delicately balanced, jeweled gauges, so sensitive a watchmaker is employed to keep them accurate, has long been the practice at J&L in production of cold finished steel.

J&L Steel Data Chart, 29 x 45 inches, shows many tables (SAE, AISI, NE, and others) of tolerances, weights, hardness, machinability ratings, heat treatments, carburizing practice and spindle speeds for cold finished steel bars. For a copy write to Publicity Manager, Jones & Laughlin Steel Corporation, Pittsburgh, 30, Pa.

No. 2 Foundry Pig Iron at Chicago

(per gross ton, at furnace)

	1931	1932	1933	1934	1935	1936
January	$17.50	$16.50	$15.50	$17.50	$18.50	$19.50
February	17.50	16.50	15.50	17.50	18.50	19.50
March	17.50	16.50	15.50	17.50	18.50	19.50
April	17.50	16.00	15.50	17.75	18.50	19.50
May	17.50	16.00	15.80	18.50	18.50	19.50
June	17.50	16.00	16.00	18.50	18.50	19.50
July	17.50	15.50	16.78	18.50	18.50	19.50
August	17.50	15.50	17.10	18.50	18.50	19.50
September	17.50	15.50	17.50	18.50	18.50	19.50
October	17.00	15.50	17.50	18.50	18.70	19.50
November	17.00	15.50	17.50	18.50	19.50	19.75
December	16.70	15.50	17.50	18.50	19.50	20.50
Average	17.35	15.87	16.47	18.19	18.68	19.60

	1937	1938	1939	1940	1944	1945
January	$21.00	$24.00	$21.00	$23.00	1943	$24.00
February	21.25	24.00	21.00	23.00	1942	24.25
March	23.60	24.00	21.00	23.00	1941	25.03
April	24.00	24.00	21.00	23.00	price	25.00
May	24.00	24.00	21.00	23.00	fixed	25.00
June	24.00	23.20	21.00	23.00	at	25.00
July	24.00	20.00	21.00	23.00	$24.00	25.00
August	24.00	20.00	21.00	23.00		25.00
September	24.00	20.25	22.00	23.00		25.00
October	24.00	21.00	23.00	23.00		25.19
November	24.00	21.00	23.00	23.00		25.75
December	24.00	21.00	23.00	23.40		25.75
Average	23.49	22.20	21.59	23.03		25.00

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No. 2 Foundry Pig Iron at Granite City, Ill.*

(per gross ton, at furnace)

	1931	1932	1933	1934	1935	1936
January	$18.25	$18.33	$18.33	$17.50	$18.50	$19.50
February	18.25	18.33	18.33	17.50	18.50	19.50
March	18.25	18.33	18.33	17.50	18.50	19.50
April	18.25	18.33	17.34	17.75	18.50	19.50
May	18.25	18.33	16.55	18.50	18.50	19.50
June	18.25	18.33	16.85	18.50	18.50	19.50
July	18.25	18.33	17.35	18.50	18.50	19.50
August	18.25	18.33	17.85	18.50	18.50	19.50
September	18.25	18.33	17.50	18.50	18.50	19.50
October	18.25	18.33	17.50	18.50	18.70	19.50
November	18.25	18.33	17.50	18.50	19.50	19.75
December	18.25	18.33	17.50	18.50	19.50	20.50
Average	18.25	18.33	17.58	18.19	18.68	19.60

	1937	1938	1939	1940	1944	1945
January	$21.00	$24.00	$21.00	$23.00	1943	$24.00
February	21.25	24.00	21.00	23.00	1942	24.25
March	23.60	24.00	21.00	23.00	1941	25.00
April	24.00	24.00	21.00	23.00	price	25.00
May	24.00	24.00	21.00	23.00	fixed	25.00
June	24.00	23.00	21.00	23.00	at	25.00
July	24.00	20.00	21.00	23.00	$24.00	25.00
August	24.00	20.00	21.00	23.00		25.00
September	24.00	20.25	22.00	23.00		25.00
October	24.00	21.00	23.00	23.00		25.19
November	24.00	21.00	23.00	23.00		25.75
December	24.00	21.00	23.00	23.50		25.75
Average	23.49	22.20	21.59	23.04		25.00

* Prior to Sept. 1933, St. Louis prices are given.

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No. 2 Foundry Pig Iron at Buffalo

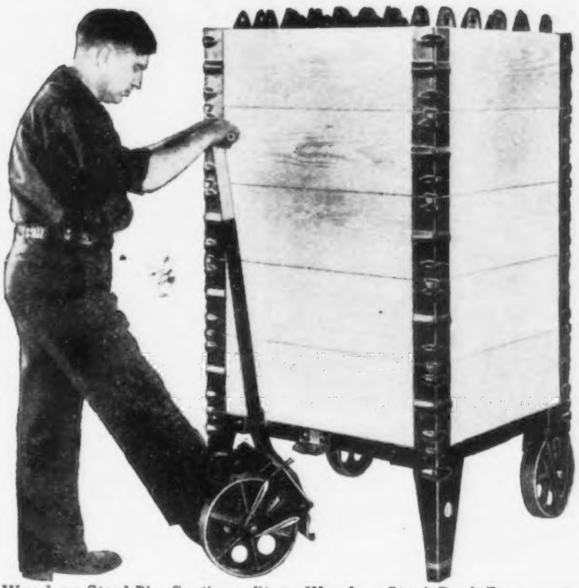
(per gross ton, at furnace)

	1931	1932	1933	1934	1935	1936
January	$17.50	$16.00	$16.00	$17.50	$18.50	$19.50
February	17.50	16.00	16.00	17.50	18.50	19.50
March	17.50	16.00	16.00	17.50	18.50	19.50
April	17.50	16.00	16.00	17.50	18.50	19.50
May	17.13	16.00	16.00	18.50	18.50	19.50
June	17.00	16.00	16.00	18.50	18.50	19.50
July	17.00	16.00	16.50	18.50	18.50	19.50
August	17.00	16.00	17.10	18.50	18.50	19.50
September	17.00	16.00	17.50	18.50	18.50	19.50
October	17.00	16.00	17.50	18.50	18.50	19.50
November	17.00	16.00	17.50	18.50	19.50	19.75
December	16.80	16.00	17.50	18.50	19.50	20.50
Average	17.16	16.00	16.63	18.17	18.67	19.60

	1937	1938	1939	1940	1944	1945
January	$21.00	$24.00	$21.00	$23.00	1943	$24.00
February	21.25	24.00	21.00	23.00	1942	24.25
March	23.60	24.00	21.00	23.00	1941	25.00
April	24.00	24.00	21.00	23.00	price	25.00
May	24.00	24.00	21.00	23.00	fixed	25.00
June	24.00	23.20	21.00	23.00	at	25.00
July	24.00	20.00	21.00	23.00	$24.00	25.00
August	24.00	20.00	21.00	23.00		25.00
September	24.00	20.13	22.00	23.00		25.00
October	24.00	20.88	23.00	23.00		25.19
November	24.00	21.00	23.00	23.00		25.75
December	24.00	21.00	23.00	23.40		25.75
Average	23.49	22.18	21.59	23.03		25.00

SAVE 50% FLOOR SPACE EQUIPMENT COST LABOR COST

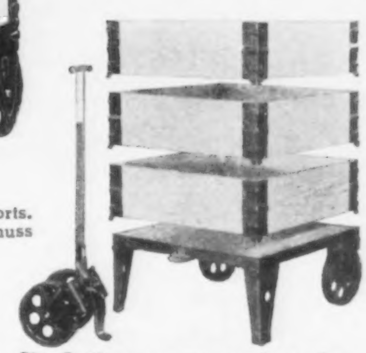
With the
TURNER SYSTEM
OF MATERIALS HANDLING



Wood or Steel Bin Sections fit on Wood or Steel Deck Transports. One man does the work of several — and there is no muss or fuss.

The Turner System is a scientifically standardized scheme of interlocking and interchangeable units which can be applied to every plant operation. It is designed to cut labor costs, to save space, and to reduce materials handling accidents.

An amazingly flexible and efficient materials handling procedure has been built around the system. Its foundation is the perfect square. The ruggedly built "Transport" can be moved in restricted space with the hand "Jimmy," Power Lift Truck, Crane, Tractor or Conveyor.



Bin Sections are removed as the load diminishes and placed on the "empty" to build its capacity.

"Deliver the Bin and Save the Handling"

FLOOR PLATE DECK TRANSPORT provides point contact with hot materials. Non-skid embossments hold materials on deck.

60 Days Free Trial

We are so sure that you can benefit from the use of this system that we are willing to ship an assortment of standard units for 60 DAYS FREE TRIAL. Use them for at least two months. Keep them if (in YOUR opinion) they save labor, time and space. Return them if they don't. There is absolutely no obligation, except that you assume nominal transportation charges.

This Book Will Explain the "Turner System"

Industrial Engineers have long used the TURNER SYSTEM in their work to increase plant efficiency. You can get a complete outline of it in a twenty-page book sent to established companies. Write on your letterhead for your copy.

Removable Shelf Racks fit on movable Transports ready to be moved with hand "Jimmy," power lift truck, crane, tractor, or conveyor.

FACTORY SERVICE COMPANY

4621 NORTH TWENTY-FIRST STREET MILWAUKEE 9, WISCONSIN

Malleable Pig Iron at Mahoning or Shenango Valley Furnaces

(per gross ton)

	1931	1932	1933	1934	1935	1936
January	$17.50	$16.00	$14.50	$17.50	$18.50	$19.50
February	17.25	15.62	14.50	17.50	18.50	19.50
March	17.00	15.50	14.50	17.50	18.50	19.50
April	17.00	15.50	14.50	17.75	18.50	19.50
May	17.00	15.20	14.70	18.50	18.50	19.50
June	17.00	15.00	15.50	18.50	18.50	19.50
July	17.00	14.50	16.00	18.50	18.50	19.50
August	17.00	14.50	16.70	18.50	18.50	19.50
September	17.00	14.50	17.50	18.50	18.50	19.50
October	16.88	14.50	17.50	18.50	18.50	19.50
November	16.50	14.50	17.50	18.50	19.50	19.75
December	16.20	14.50	17.50	18.50	19.50	20.50
Average	16.94	14.98	15.91	18.19	18.67	19.60

	1937	1938	1939	1940	1944	1945
January	$21.00	$24.00	$21.00	$23.00	1943	$24.00
February	21.25	24.00	21.00	23.00	1942	24.25
March	23.60	24.00	21.00	23.00	1941	25.00
April	24.00	24.00	21.00	23.00	price	25.00
May	24.00	24.00	21.00	23.00	fixed	25.00
June	24.00	23.00	21.00	23.00	at	25.00
July	24.00	20.00	21.00	23.00	$24.00	25.00
August	24.00	20.00	21.00	23.00		25.00
September	24.00	20.25	22.00	23.00		25.00
October	24.00	21.00	23.00	23.00		25.19
November	24.00	21.00	23.00	23.00		25.75
December	24.00	21.00	23.00	23.50		25.75
Average	23.49	22.20	21.59	23.04		25.00

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No. 2 Foundry Pig Iron at Mahoning or Shenango Valley Furnaces

(per gross ton)

	1931	1932	1933	1934	1935	1936
January	$17.00	$15.50	$14.50	$17.50	$18.50	$19.50
February	16.75	15.12	14.50	17.50	18.50	19.50
March	16.50	15.00	14.50	17.50	18.50	19.50
April	17.00	15.00	14.50	17.75	18.50	19.50
May	17.00	14.70	14.70	18.50	18.50	19.50
June	17.00	14.50	15.50	18.50	18.50	19.50
July	17.00	14.50	16.00	18.50	18.50	19.50
August	17.00	14.50	16.70	18.50	18.50	19.50
September	17.00	14.50	17.50	18.50	18.50	19.50
October	16.63	14.50	17.50	18.50	18.50	19.50
November	16.00	14.50	17.50	18.50	19.50	19.75
December	15.70	14.50	17.50	18.50	19.50	20.50
Average	16.72	14.73	15.91	18.19	18.67	19.60

	1937	1938	1939	1940	1944	1945
January	$21.00	$24.00	$21.00	$23.00	1943	$24.00
February	21.25	24.00	21.00	23.00	1942	24.25
March	23.60	24.00	21.00	23.00	1941	25.00
April	24.00	24.00	21.00	23.00	price	25.00
May	24.00	24.00	21.00	23.00	fixed	25.00
June	24.00	23.20	21.00	23.00	at	25.00
July	24.00	20.00	21.00	23.00	$24.00	25.00
August	24.00	20.00	21.00	23.00		25.00
September	24.00	20.25	22.00	23.00		25.00
October	24.00	21.00	23.00	23.00		25.19
November	24.00	21.00	23.00	23.00		25.75
December	24.00	21.00	23.00	23.40		25.75
Average	23.49	22.20	21.59	23.03		25.00

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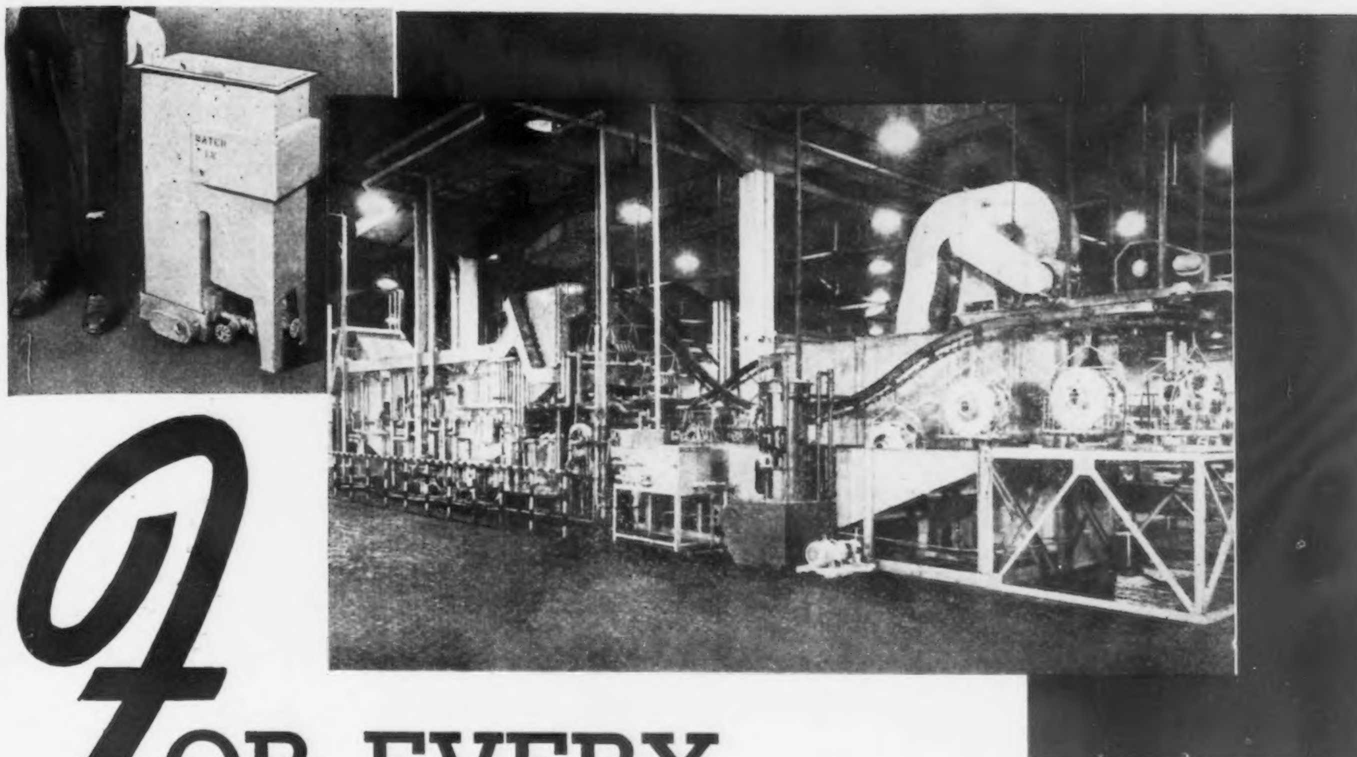
Southern No. 2 Foundry Pig Iron at Birmingham

(per gross ton)

	1932	1933	1934	1935	1936	1937
January	$11.50	$11.00	$13.50	$14.50	$15.50	$17.38
February	11.00	11.00	13.50	14.50	15.50	17.68
March	11.00	11.00	13.50	14.50	15.50	19.93
April	11.00	11.25	13.50	14.50	15.50	20.38
May	11.00	12.00	14.30	14.50	15.50	20.38
June	11.00	12.00	14.50	14.50	15.50	20.38
July	11.00	12.50	14.50	14.50	15.50	20.38
August	11.00	13.10	14.50	14.50*	15.88	20.38
September	11.00	13.50	14.50	14.50	15.88	20.38
October	11.00	13.50	14.50	14.50	15.88	20.38
November	11.00	13.50	14.50	14.75	16.13	20.38
December	11.00	13.50	14.50	15.50	16.88	20.38
Average	11.04	12.32	14.15	14.60	15.76	19.87

	1938	1939	1940	1941	1944	1945
January	$20.38	$17.38	$19.38	$19.38	1943	$20.38
February	20.38	17.38	19.38	19.38	1942	20.63
March	20.38	17.38	19.38	19.89	price	21.38
April	20.38	17.38	19.38	20.38	fixed	21.38
May	20.38	17.38	19.38	20.38	at	21.38
June	19.58	17.38	19.38	20.38	$20.38	21.38
July	16.38	17.38	19.38	20.38		21.38
August	16.38	17.38	19.38	20.38		21.38
September	16.63	18.38	19.38	20.38		21.38
October	17.38	19.38	19.38	20.38		21.57
November	17.38	19.38	19.38	20.38		22.13
December	17.38	19.38	19.38	20.38		22.13
Average	18.58	17.96	19.38	20.17		21.38

* 38c. a ton deducted for 0.70 phosphorus and over.



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Vapor Degreasing Solvents
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Pioneering the advancement of vapor degreasing, laboratory research and experience in the field has produced PERM-A-CLOR, the most highly stabilized chlorinated solvent on the market. For a solvent of average stability, Detrex markets TRIAD. Each has its specific application.

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Lake Superior Charcoal Pig Iron at Chicago

(per gross ton)

	1934	1935	1936	1937	1938	1939
January	$23.54	$24.04	$25.25	$26.54	$30.24	$28.34
February	23.54	24.04	25.25	26.79	30.24	28.34
March	23.54	24.04	25.25	29.44	30.24	28.34
April	24.79	24.13	25.25	30.04	30.32	28.34
May	24.04	24.25	25.25	30.04	30.34	28.34
June	24.04	24.25	25.25	30.04	30.34	28.34
July	24.04	24.25	25.25	30.04	28.34	28.34
August	24.04	24.25	25.25	30.04	28.34	28.34
September	24.01	24.25	25.25	30.04	28.34	29.34
October	24.04	24.85	25.25	30.04	28.34	30.34
November	24.04	25.25	25.50	30.16	28.34	30.34
December	24.04	25.25	26.25	30.24	2[illegible].34	30.34
Average	23.98	24.35	25.35	29.45	29.31	28.92

	1940	1941	1942	1943	1944	1945
January	$30.34	$30.34	$31.34	$31.34	$37.34	$37.34
February	30.34	30.34	31.34	31.34	37.34	37.34
March	30.34	30.34	31.34	31.34	37.34	41.09
April	30.34	30.34	31.34	31.34	37.34	42.34
May	30.34	31.09	31.34	31.34	37.34	42.34
June	30.34	31.34	31.34	31.34	37.34	42.34
July	30.34	31.34	31.34	31.34	37.34	42.34
August	30.34	31.34	31.34	31.34	37.34	42.34
September	30.34	31.34	31.34	37.34	37.34	42.34
October	30.34	31.34	31.34	37.34	37.34	42.34
November	30.34	31.34	31.34	37.34	37.34	42.34
December	30.34	31.34	31.34	37.34	37.34	42.34
Average	30.34	30.99	31.34	3[illegible].34	37.34	41.40

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No. 1 Heavy Melting Scrap at Pittsburgh

(per gross ton)

	1933	1934	1935	1936	1937	1938
January	$8.30	$13.00	$13.35	$14.44	$19.50	$14.25
February	8.50	14.00	13.06	14.96	19.81	14.13
March	8.88	14.44	12.19	15.75	23.15	13.67
April	10.00	14.19	11.55	15.75	22.25	12.44
May	11.75	12.80	11.62	14.50	19.38	11.50
June	11.75	11.75	11.75	13.57	18.45	11.30
July	12.72	11.75	11.95	14.19	19.75	14.25
August	13.85	11.31	12.94	15.94	21.85	15.45
September	12.94	10.75	13.25	17.80	19.62	15.25
October	12.15	10.35	13.40	17.87	16.62	15.00
November	11.50	10.94	13.56	17.31	13.75	15.28
December	12.13	13.01	14.05	18.31	13.75	15.75
Average	11.21	12.36	12.72	15.87	18.86	14.02

	1939	1940	1941	1943	1944	1945
January	$15.72	$18.35	$22.13	1942	$20.00	price
February	15.72	17.50	21.00	price	20.00	fixed
March	15.97	16.88	21.00	fixed	20.00	at
April	15.31	16.55	20.20	at	20.00	$20.00
May	14.48	18.37	20.00	$20.00	20.00	
June	15.12	20.06	[illegible]0.00		20.00	
July	15.56	19.10	20.00		20.00	
August	16.15	18.56	20.00		19.95	
September	19.88	20.00	20.00		18.25	
October	23.05	21.45	20.00		16.10	
November	20.56	21.69	20.00		17.13	
December	18.58	22.28	20.00		19.94	
Average	17.17	19.23	20.36		19 28	

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No. 1 Heavy Melting Scrap at Philadelphia

(per gross ton)

	1933	1934	1935	1936	1937	1938
January	$6.75	$11.70	$11.40	$12.62	$17.37	$14.75
February	6.75	11.75	[illegible].62	13.25	18.50	14.75
March	6.75	11.88	10.50	13.75	19.60	14.55
April	7.19	11.69	10.00	13.69	20.00	13.37
May	8.90	10.95	10.44	12.81	18.62	12.13
June	9.25	10.50	10.50	12.00	17.20	12.20
July	10.68	10.30	10.55	12.31	19.00	13.63
August	11.95	9.94	11.44	14.00	19.75	14.35
September	11.25	9.63	12.38	15.40	19.00	14.25
October	10.20	9.53	12.10	15.75	16.38	14.75
November	9.75	9.94	12.13	15.12	13.75	14.75
December	10.44	10.75	12.50	15.50	14.25	15.12
Average	9.16	10.71	11.30	13.85	17.78	14.05

	1939	1940	1941	1943	1944	1945
January	$15.25	$18.00	$20.50	1942	$18.75	$18.75
February	15.25	17.38	20.00	price	18.75	18.75
March	15.38	17.12	20.00	fixed	18.75	18.75
April	15.62	16.75	19.00	at	18.75	18.75
May	15.25	17.56	18.75	$18.75	18.75	18.40
June	15.41	19.69	18.75		18.75	18.25
July	15.62	18.95	18.75		18.75	18.75
August	18.25	19.56	18.75		18.60	18.75
September	18.87	20.50	18.75		16.66	18.75
October	22.35	20.70	18.75		14.60	18.75
November	20.75	20.75	18.75		15.50	18.75
December	18.92	20.85	18.75		18.50	18.75
Average	17.08	18.98	19.13		17.01	18.68

No. 1 Heavy Melting Scrap at Chicago

(per gross ton)

	1933	1934	1935	1936	1937	1938
January	$5.25	$10.50	$11.80	$13.37	$17.81	$13.00
February	5.25	11.00	11.25	14.19	19.25	12.69
March	5.25	12.13	10.50	14.75	20.60	12.15
April	6.00	11.75	9.85	14.34	20.56	11.37
May	8.45	11.05	10.06	12.87	17.12	11.00
June	8.91	9.75	9.97	12.85	15.70	10.45
July	10.42	9.55	10.35	13.37	17.62	12.00
August	10.46	9.19	12.38	15.19	19.70	13.75
September	9.84	8.50	12.50	16.15	17.56	13.50
October	9.47	8.75	12.50	16.25	14.69	12.88
November	8.60	9.25	13.00	16.50	12.50	14.20
December	8.94	10.50	13.25	17.00	12.38	13.75
Average	8.07	10.16	11.45	14.74	17.12	12.56

	1939	1940	1941	1943	1944	1945
January	$13.87	$16.38	$20.00	1942	$18.75	price
February	13.94	15.75	19.25	price	18.75	fixed
March	14.25	15.69	19.88	fixed	18.75	at
April	13.37	15.33	18.95	at	18.75	$18.75
May	12.75	17.00	18.75	$18.75	18.75	
June	13.45	18.19	18.75		18.75	
July	13.50	17.35	18.75		18.75	
August	13.87	18.03	18.75		18.75	
September	16.22	19.22	18.75		18.69	
October	19.16	19.75	18.75		18.90	
November	17.85	20.06	18.75		17.00	
December	16.67	20.60	18.75		18.69	
Average	14.91	17.73	19.01		18.27	

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Scrap Rails, 2 ft and under

(per gross ton, f.o.b. Pittsburgh)

	1938	1939	1940	1941	1943	1944
January	$18.25	$17.75	$22.75	$26.75	1942	$24.25
February	18.75	18.25	21.00	....	price	24.25
March	17.75	18.50	21.00	26.75	fixed	24.25
April	17.75	18.25	21.50	19.75*	at	24.25
May	16.75	17.25	22.75	19.75	$24.25	24.25
June	15.75	17.75	25.25	24.25**		24.25
July	16.25	17.75	22.75	24.25		24.25†
August	16.75	19.25	22.75	24.25		
September	17.25	26.25	25.75	24.25		
October	17.25	26.75	26.75	24.25		
November	17.25	22.75	27.25	24.25		
December	17.25	22.75	27.25	24.25		
Average	17.21	20.93	23.89	23.88		

* OPA ceiling price.
** Readjusted OPA ceiling price at Pittsburgh.
† Rails 2 ft. in length eliminated from MPR No. 4 by OPA action in July.

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No. 1 Machinery Cast Scrap at Cincinnati

(per gross ton)

	1929	1932	1933	1934	1935	1936
January	$17.14	$10.00	$7.55	$9.50	$10.25	$11.37
February	17.24	10.00	6.50	9.50	9.94	11.75
March	17.19	10.00	6.50	10.00	9.19	12.40
April	17.19	10.00	6.50	10.00	8.75	12.19
May	17.19	10.00	6.75	9.45	8.87	11.50
June	17.19	8.50	7.13	9.00	9.06	11.20
July	17.19	8.00	8.75	9.00	9.10	11.19
August	17.05	7.50	9.50	8.88	9.94	12.43
September	16.96	8.00	9.50	8.75	10.00	13.60
October	16.92	8.25	9.50	8.75	10.50	14.00
November	16.57	8.25	9.12	8.88	10.50	14.00
December	16.52	8.25	9.19	9.85	10.90	15.12
Average	17.03	8.90	8.04	9.30	9.75	12.56

	1937	1938	1939	1940	1941†	1945
January	$15.75	$11.25	$13.75	$17.65	$22.75	1944
February	16.12	10.87	13.75	16.69	22.50	1943
March	17.30	11.05	14.38	16.25	*22.50	1942
April	17.37	10.62	13.56	16.05	....	price
May	14.44	10.25	12.00	16.88	....	fixed
June	14.00	10.10	12.13	19.38	....	at
July	14.87	11.75	12.25	18.65	....	$20.00
August	16.25	12.65	12.80	18.75	....	
September	14.25	12.31	15.38	20.12	*22.50	
October	13.38	12.31	19.55	20.55	22.50	
November	11.85	13.15	18.88	21.00	22.50	
December	10.75	13.88	17.75	22.50	22.50	
Average	14.69	11.68	14.68	18.71	....	

* In transition from open market quotations to OPA price maximums, this grade not quoted. However, in September, the maximum schedules were revised to include this grade.

† Ceiling price does not include delivery costs.

TO MAKE *Modern Design* TAKE SHAPE FASTER

Today Clearing Press applications are far greater than ever before. In planning manufacturing operations to make your Modern Design become a finished product, Clearing recommendations can often be the solution to problems involving better, faster methods. Recent experience has demonstrated that Clearing Press engineering provides not only the essential advantages of accurate, faster production, but in many instances is also the only means of reproducing product design with absolute fidelity.

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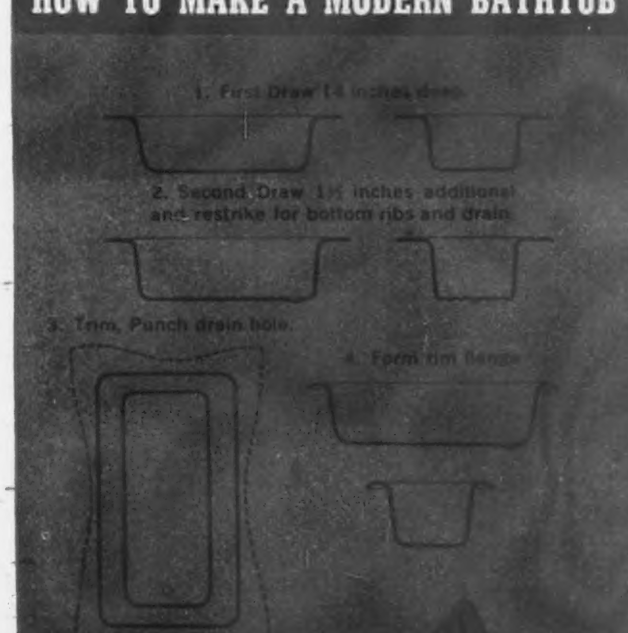
HOW TO MAKE A MODERN BATHTUB



CLEARING ★

MECHANICAL AND HYDRAULIC PRESSES
FOR SUCH OPERATIONS AS DRAWING ★ BLANKING ★ FORMING ★ FORGING

No. I Machinery Cast Scrap at Chicago

(per gross ton*)

	1929	1932	1933	1934	1935	1936
January	$15.81	$7.75	$6.25	$9.50	$10.60	$12.00
February	16.25	7.50	6.25	9.50	10.00	12.75
March	16.00	7.20	6.25	9.50	9.38	13.10
April	16.00	7.00	7.06	9.50	9.00	12.50
May	15.39	6.50	8.45	8.90	9.00	12.00
June	14.75	6.13	8.75	7.50	9.00	12.00
July	14.50	6.00	10.63	8.05	9.30	12.12
August	14.50	6.10	10.50	8.00	10.87	13.37
September	14.50	6.25	10.00	8.00	11.19	13.60
October	14.50	6.25	9.88	8.00	11.25	14.00
November	13.63	6.25	8.60	8.25	11.50	14.00
December	13.50	6.25	8.76	9.65	11.80	14.75
Average	15.11	6.60	8.45	8.69	10.24	13.02

	1937	1938	1939	1940	1941†	1945
January	$15.87	$12.50	$12.56	$14.00	$18.88	1944
February	16.25	12.19	12.75	13.75	19.25	1943
March	17.40	11.65	12.75	13.56	20.75	1942
April	17.12	10.88	12.12	14.81	*22.33	price
May	15.25	10.75	11.75	16.31	21.40	fixed
June	15.00	10.45	12.15	17.31	20.00	at
July	15.75	12.00	12.25	16.75	20.00	$20.00
August	16.55	13.35	12.25	16.88	20.00	
September	14.38	13.00	14.50	17.13	20.00	
October	13.18	12.25	16.87	17.75	20.00	
November	11.65	12.60	15.65	18.00	20.00	
December	12.12	12.50	14.50	19.13	20.00	
Average	15.04	12.01	13.34	16.28	20.21	

* Changed from net ton basis April 30, 1941.
† Ceiling price does not include delivery costs.

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Foundry Coke, Connellsville

(net ton at oven)

	1934	1935	1936	1937	1938	1939
January	$4.25	$4.60	$4.25	$4.50	$5.00	$4.75
February	4.25	4.60	4.25	4.50	5.00	4.75
March	4.25	4.60	4.25	4.50	5.00	4.75
April	4.60	4.60	4.25	5.00	5.00	4.75
May	4.60	4.60	4.25	5.25	5.00	4.75
June	4.60	4.15	4.25	5.25	4.85	4.75
July	4.60	3.88	4.00	5.00	4.75	4.75
August	4.60	4.00	4.00	5.00	4.75	4.75
September	4.60	4.00	4.05	5.00	4.75	5.12
October	4.60	4.20	4.25	5.00	4.75	5.65
November	4.60	4.25	4.25	5.00	4.75	5.75
December	4.60	4.15	4.40	5.00	4.75	5.75
Average	4.51	4.30	4.20	4.92	4.86	5.02

	1940	1941	1942	1943	1944	1945
January	$5.50	$5.75	$6.88	$6.88	$8.06	$8.25
February	5.31	5.75	6.88	7.13	8.25	8.25
March	5.25	5.85	6.88	7.38	8.25	8.25
April	5.25	5.62	6.88	7.38	8.25	8.25
May	5.25	6.72	6.88	7.44	8.25	8.47
June	5.25	6.88	6.88	7.50	8.25	9.00
July	5.25	6.88	6.88	7.50	8.25	9.00
August	5.25	6.88	6.88	7.50	8.25	9.00
September	5.25	6.88	6.88	7.50	8.25	9.00
October	5.25	6.88	6.88	7.50	8.25	9.00
November	5.61	6.88	6.88	7.50	8.25	9.00
December	5.75	6.88	6.88	7.50	8.25	9.00
Average	5.35	6.49	6.88	7.39	8.24	8.71

○ ○ ○

Furnace Coke, Connellsville

(net ton at oven)

	1934	1935	1936	1937	1938	1939
January	$3.60	$3.85	$3.65	$4.00	$4.00	$3.75
February	3.50	3.85	3.65	4.06	4.00	3.75
March	3.50	3.85	3.65	4.25	4.00	3.75
April	3.85	3.85	3.65	4.51	4.00	3.75
May	3.85	3.85	3.65	4.60	4.00	3.75
June	3.85	3.59	3.65	4.58	3.85	3.75
July	3.85	3.27	3.50	4.35	3.75	3.75
August	3.85	3.29	3.61	4.35	3.75	3.75
September	3.85	3.25	3.69	4.27	3.75	4.25
October	3.85	3.53	3.75	4.25	3.75	4.90
November	3.85	3.60	3.75	4.25	3.75	5.00
December	3.85	3.57	3.92	4.00	3.75	5.00
Average	3.79	3.61	3.68	4.29	3.86	4.09

	1940	1941	1942	1943	1944	1945
January	$4.20	$5.50	$6.13	$6.00	$7.00	$7.00
February	4.00	5.50	6.00	6.25	7.00	7.00
March	4.00	5.52	6.00	6.50	7.00	7.00
April	4.00	5.63	6.00	6.50	7.00	7.00
May	4.00	6.00	6.00	6.50	7.00	7.15
June	4.00	6.13	6.00	6.50	7.00	7.50
July	4.20	6.13	6.00	6.50	7.00	7.50
August	4.63	6.13	6.00	6.50	7.00	7.50
September	4.75	6.13	6.00	6.50	7.00	7.50
October	4.75	6.13	6.00	6.50	7.00	7.50
November	5.10	6.13	6.00	6.50	7.00	7.50
December	5.38	6.13	6.00	6.60	7.00	7.50
Average	4.42	5.92	6.01	6.45	7.00	7.30

STATISTICAL

Virgin Aluminum, 99 Pct Plus
(cents per pound, delivered)

	1929	1932	1933	1934	1935	1936
January....	23.90	23.30	23.30	23.30	20.50	20.50
February...	23.90	23.30	23.30	21.65	20.50	20.50
March.....	23.90	23.30	23.30	21.65	20.50	20.50
April.......	23.90	23.30	23.30	21.65	20.50	20.50
May.......	23.90	23.30	23.30	21.65	20.50	20.50
June.......	23.90	23.30	23.30	21.65	20.50	20.50
July.......	23.90	23.30	23.30	21.65	20.50	20.50
August.....	23.90	23.30	23.30	21.65	20.50	20.50
September..	23.90	23.30	23.30	21.65	20.50	20.50
October....	23.90	23.30	23.30	21.49	20.50	20.50
November..	23.90	23.30	23.30	20.50	20.50	20.50
December..	23.90	23.30	23.30	20.50	20.50	20.50
Average	23.90	23.30	23.30	21.58	20.50	20.50

	1937	1938	1939	1940	1941	1945
January....	20.50	20.00	20.00	20.00	17.00	1944
February...	20.50	20.00	20.00	20.00	17.00	1943
March.....	20.00	20.00	20.00	20.00	17.00	1942
April.......	20.00	20.00	20.00	20.00	17.00	price
May.......	20.00	20.00	20.00	20.00	17.00	fixed
June.......	20.00	20.00	20.00	20.00	17.00	at
July.......	20.00	20.00	20.00	20.00	17.00	15.00
August.....	20.00	20.00	20.00	20.00	17.00	
September..	20.00	20.00	20.00	20.00	17.00	
October....	20.00	20.00	20.00	20.00	15.00	
November..	20.00	20.00	20.00	20.00	15.00	
December..	20.00	20.00	20.00	20.00	15.00	
Average	20.08	20.00	20.00	20.00	16.87	

Straits Tin at New York
(cents per pound)

	1929	1932	1933	1934	1935	1936
January....	49.21	21.80	22.70	51.98	50.91	47.23
February...	49.39	21.97	23.51	51.78	49.99	47.94
March.....	48.85	21.81	24.35	53.84	46.88	48.00
April.......	45.93	19.17	27.16	55.66	50.05	46.97
May.......	43.88	20.90	35.94	53.57	51.10	46.31
June.......	44.20	19.58	44.23	51.31	51.08	42.24
July.......	46.29	20.89	46.28	51.94	52.31	42.96
August.....	46.60	22.98	44.71	5..99	50.46	42.57
September..	45.32	24.76	46.46	51.52	49.05	44.77
October....	42.25	23.91	47.95	51.01	51.25	44.95
November..	40.18	23.31	53.14	51.24	51.88	51.30
December..	39.87	22.70	52.91	50.92	49.77	51.85
Average	45.16	21.98	39.12	52.23	50.39	46.42

	1937	1938	1939	1940	1941	1945
January....	50.90	41.54	46.39	46.73	50.16	1944
February...	52.10	41.23	45.64	45.85	51.41	1943
March.....	62.74	41.16	46.17	47.07	52.07	1942
April.......	59.02	38.41	47.16	46.96	52.03	price
May.......	55.64	36.83	49.00	51.51	52.18	fixed
June.......	55.88	40.36	48.81	54.64	52.68	at
July.......	59.34	43.38	48.53	51.61	53.41	52.00
August.....	59.40	43.26	48.80	51.21	52.45	
September..	58.64	43.40	Nom.	50.30	52.00	
October....	51.52	45.25	55.68	51.50	52.00	
November..	43.34	46.29	52.65	50.57	52.00	
December..	42.96	46.21	51.40	50.11	52.00	
Average	54.29	42.28	49.11	49.84	52.03	

Electrolytic Copper, Conn. Valley
(cents per pound)

	1929	1931	1932	1933	1934	1935
January....	16.84	10.03	7.33	5.00	8.18	9.00
February...	18.05	9.96	6.25	5.00	8.00	9.00
March.....	21.38	10.14	5.99	5.26	8.00	9.00
April.......	19.93	9.69	5.79	5.68	8.39	9.00
May.......	18.00	8.94	5.51	6.93	8.50	9.00
June.......	18.00	8.31	5.39	8.00	8.82	8.88
July.......	18.00	7.93	5.28	8.91	9.00	8.00
August.....	18.00	7.52	5.43	9.00	9.00	8.22
September..	18.03	7.26	6.21	9.00	9.00	8.77
October....	18.00	7.01	5.97	8.25	9.00	9.19
November..	18.00	6.80	5.31	8.16	9.00	9.25
December..	18.00	6.85	5.04	8.12	9.00	9.25
Average	18.35	8.37	5.79	7.28	8.66	8.88

	1936	1937	1938	1939	1940	1945
January....	9.25	12.66	10.42	11.25	12.22	1944
February...	9.25	13.60	10.00	11.25	11.40	1943
March.....	9.25	15.99	10.00	11.25	11.38	1942
April.......	9.40	15.35	10.00	10.47	11.33	1941
May.......	9.50	14.00	9.60	10.06	11.32	price
June.......	9.50	14.00	9.00	10.00	11.37	fixed
July.......	9.60	14.00	9.81	10.22	10.81	at
August.....	9.75	14.00	10.12	10.49	10.95	12.0
September..	9.75	13.78	10.25	11.93	11.54	
October....	9.85	12.06	10.98	12.44	12.00	
November..	10.43	11.02	11.25	12.50	12.00	
December..	11.00	10.24	11.25	12.50	12.00	
Average	9.71	13.39	10.22	11.20	11.53	

Magnesium, 99.9 Pct Plus, at New York
(cents per pound)

1929......	0.56	1935......	0.30	1941....	0.27
1930......	0.48	1936......	0.30	1942....	22.50
1931......	0.34	1937......	0.30	1943....	20.50
1932......	0.29	1938......	0.30	1944....	20.50
1933......	0.28	1939......	0.27	1945....	20.50
1934......	0.26	1940......	0.27		

Zinc at New York

(cents per pound)

	1929	1932	1933	1934	1935	1936
January	6.70	3.38	3.38	4.62	4.08	5.22
February	6.70	3.19	3.04	4.73	4.06	5.23
March	6.80	3.16	3.37	4.72	4.25	5.27
April	7.04	3.10	3.68	4.72	4.38	5.27
May	6.98	2.90	4.17	4.71	4.60	5.27
June	7.00	3.16	4.70	4.59	4.67	5.26
July	7.10	2.92	5.24	4.68	4.70	5.16
August	7.15	3.13	5.28	4.63	4.92	5.17
September	7.15	3.68	5.08	4.43	5.04	5.22
October	7.09	3.41	5.12	4.19	5.21	5.22
November	6.63	3.46	4.87	4.08	5.23	5.35
December	6.09	3.50	4.82	4.06	5.22	5.64
Average	6.87	3.25	4.40	4.51	4.70	5.27

	1937	1938	1939	1940	1941	1945
January	6.20	5.35	4.89	6.03	7.65	1944
February	6.80	5.17	4.89	5.93	7.65	1943
March	7.75	4.77	4.89	6.14	7.65	1942
April	7.70	4.53	4.89	6.14	7.65	price
May	7.10	4.43	4.89	6.20	7.65	fixed
June	7.10	4.53	4.89	6.63	7.65	at
July	7.27	5.14	4.91	6.64	7.65	8.65
August	7.56	5.14	5.11	6.79	7.65	
September	7.54	5.24	6.51	7.33	7.65	
October	6.45	5.40	6.89	7.64	8.36	
November	5.98	5.12	6.89	7.64	8.65	
December	5.36	4.89	6.46	7.65	8.65	
Average	6.90	4.98	5.51	6.73	7.88	

Lead at New York

(cents per pound)

	1929	1932	1933	1934	1935	1936
January	6.65	3.75	3.00	4.00	3.69	4.50
February	6.85	3.72	3.00	4.00	3.53	4.51
March	7.41	3.15	3.15	4.00	3.58	4.60
April	7.19	3.00	3.27	4.18	3.69	4.60
May	7.00	3.00	3.65	4.14	3.96	4.60
June	7.00	2.99	4.17	3.98	4.02	4.60
July	6.80	2.73	4.46	3.77	4.12	4.60
August	6.75	3.24	4.50	3.75	4.25	4.60
September	6.88	3.47	4.50	3.68	4.41	4.60
October	6.87	3.05	4.32	3.65	4.51	4.63
November	6.29	3.04	4.29	3.57	4.50	5.11
December	6.25	3.00	4.14	3.60	4.50	5.55
Average	6.83	3.18	3.87	3.86	4.06	4.71

	1937	1938	1939	1940	1941	1945
January	6.00	4.87	4.83	5.47	5.50	1944
February	6.23	4.63	4.80	5.08	5.60	1943
March	7.19	4.50	4.82	5.19	5.77	1942
April	6.32	4.50	4.78	5.07	5.85	price
May	6.00	4.40	4.75	5.02	5.85	fixed
June	6.00	4.15	4.80	5.00	5.85	at
July	6.00	4.88	4.85	5.00	5.85	6.50
August	6.45	4.90	5.04	4.85	5.85	
September	6.40	5.00	5.45	4.93	5.85	
October	5.75	5.10	5.50	5.31	5.85	
November	5.03	5.09	5.50	5.73	5.85	
December	4.87	4.84	5.50	5.50	5.85	
Average	6.02	4.74	5.05	5.18	5.79	

50 Pct Ferrosilicon

(carloads, per gross ton, delivered East of Mississippi River)

	1933	1934	1935	1936	1937	1938
January	$74.50	$77.50	$77.50	$77.50	$69.50	'69.50
February	74.50	77.50	77.50	77.50	69.50	69.50
March	74.50	77.50	77.50	77.50	69.50	69.50
April	74.50	77.50	77.50	77.50	69.50	69.50
May	74.50	77.50	77.50	77.50	69.50	69.50
June	74.50	77.50	77.50	77.50	69.50	69.50
July	74.50	77.50	77.50	69.50	69.50	69.50
August	74.50	77.50	77.50	69.50	69.50	69.50
September	74.50	77.50	77.50	69.50	69.50	69.50
October	74.50	77.50	77.50	69.50	69.50	69.50
November	74.50	77.50	77.50	69.50	69.50	69.50
December	74.50	77.50	77.50	69.50	69.50	69.50
Average	74.50	77.50	77.50	73.50	69.50	69.50

	1939	1940	1942	1943	1944*	1945*
January	$69.50	$69.50	1941	$74.50	6.65¢	6.65¢
February	69.50	69.50	price	74.50	6.65	6.65
March	69.50	69.50	fixed	74.50	6.65	6.65
April	69.50	69.50	at	74.50	6.65	6.65
May	69.50	69.50	$74.50	74.50	6.65	6.65
June	69.50	72.00		74.49	6.65	6.65
July	69.50	74.50		6.65¢	6.65	6.65
August	69.50	74.50		6.65	6.65	6.65
September	69.50	74.50		6.65	6.65	6.65
October	69.50	74.50		6.65	6.65	6.65
November	69.50	74.50		6.65	6.65	6.65
December	69.50	74.50		6.65	6.65	6.65
Average	69.50	72.11		6.65	6.65	6.65

* Cents per lb of contained Si

Metallurgy

(CONTINUED FROM PAGE 129)

elevated temperatures. Although the available lubricants limit the maximum temperature to about 700° F, significant gains result even from temperatures as low as 400° F. In the case of annealed alloys, the use of hot drawing will decrease the number of intermediate anneals or will enable the drawing of parts previously considered impractical. The improvement seems to be less for stretching or hot-die forming than for drawing. However, the most interesting possibility is the deep drawing at moderately elevated temperatures of hardened alloys; 75S-T, 61S-T, 24S-T86, 24S-T and R301-T have as good drawing properties at 450° F as the same alloys in the annealed condition at room temperature. This fact immediately suggests the possibility of forming these high-strength alloys in the heat-treated condition, thereby avoiding the necessity of heat treating after forming with its attendant possibilities of distortion. Methods of heating the die plate and hold down pad have been sufficiently well developed for magnesium alloys which are generally deep drawn at 450° to 650° F so that this phase of the problem should offer no difficulties.

Two recently announced aluminum alloys seem to fill the gap that has existed in the field of high-strength centrifugal castings of aluminum. Both contain 3.5 pct copper and 0.5 pct beryllium while one has 1.3 pct cobalt. The alloy with cobalt likewise gives excellent results as a forging and in the form of lost-wax casting. Preliminary results indicate that these alloys can be used at higher service temperatures than the established aluminum grades.

While the 12 pct silicon die-casting alloy is still the best all around aluminum diecasting grade, a 4 pct copper-9 pct silicon alloy has been found to be an extremely good general-purpose alloy. Since this alloy is based on the use of duraluminum and other airplane scrap, it should figure prominently as a postwar secondary alloy and the cheapest aluminum material available in view of the tremendous amount of scrap on hand. Wartime experience with this alloy for

(CONTINUED ON PAGE 258)

• ACME ALUMINUM ALLOY CASTINGS

No longer need a product go to market with the handicap of excess poundage. For Acme Castings of third-the-weight aluminum alloy are made to meet—and they often exceed—the most demanding requirements. No longer need many a product possess less than aluminum's numerous other advantages.

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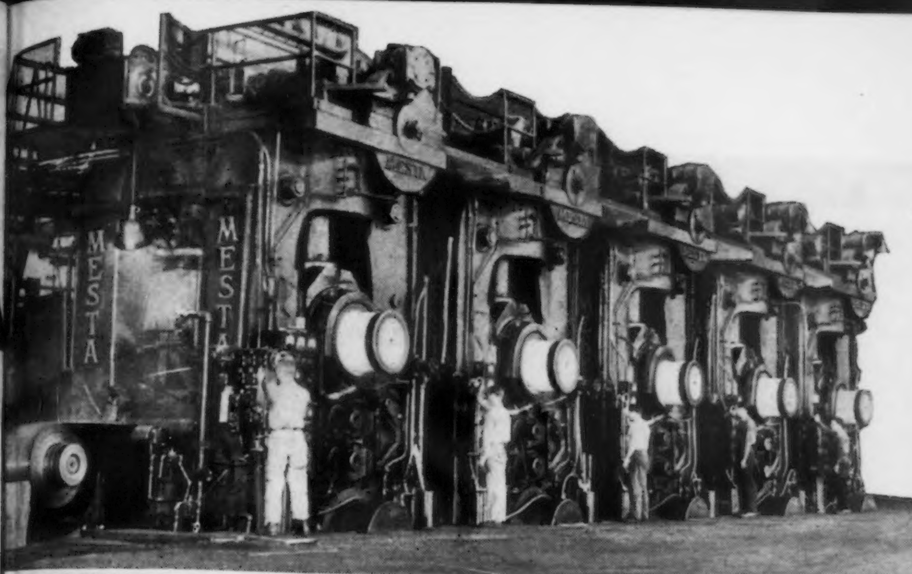
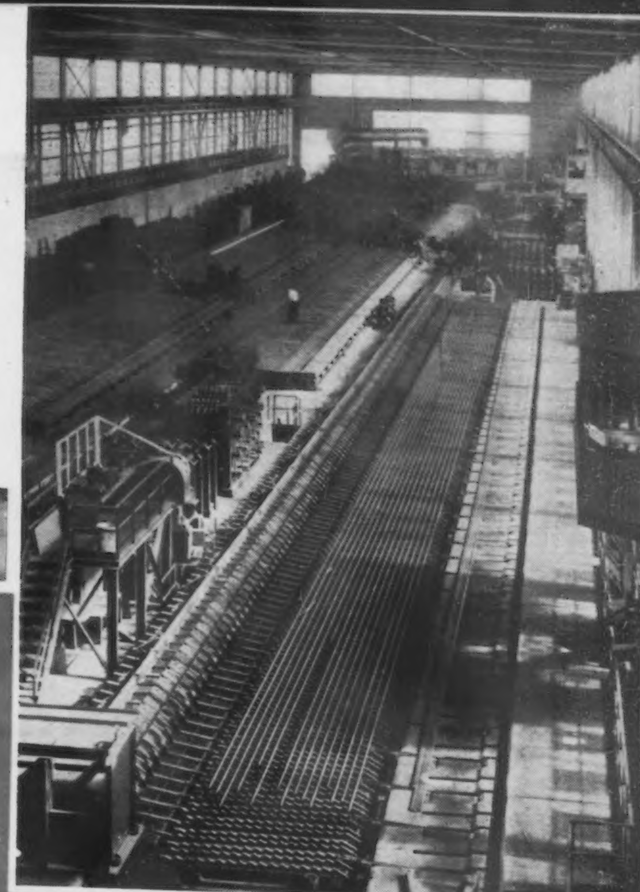
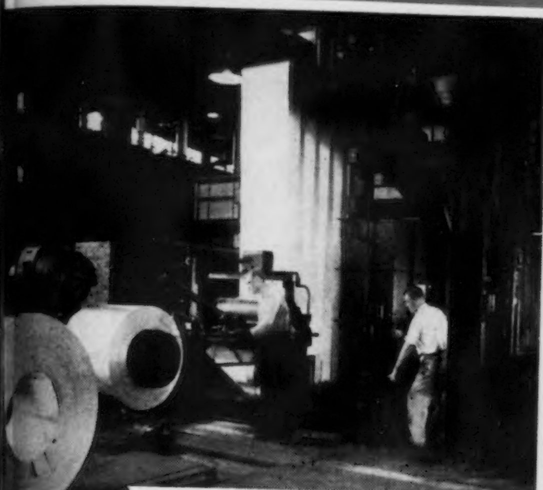




MESTA 42" HIGH SPEED FOUR-HIGH TANDEM COLD MILL FOR ROLLING TIN PLATE GAUGES

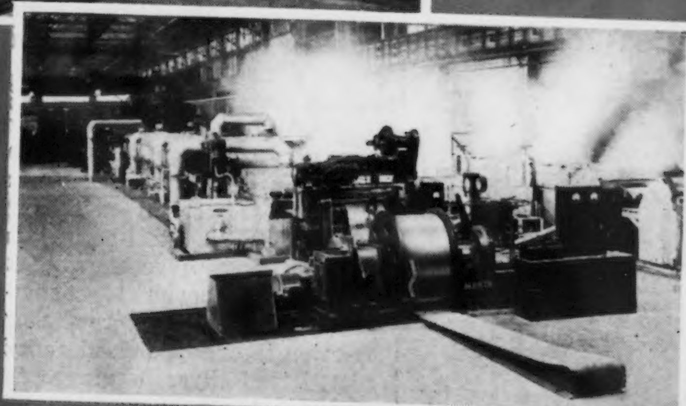
MESTA 18"—14"—10" MERCHANT MILL WITH PACK ANNEALING COOLING BED



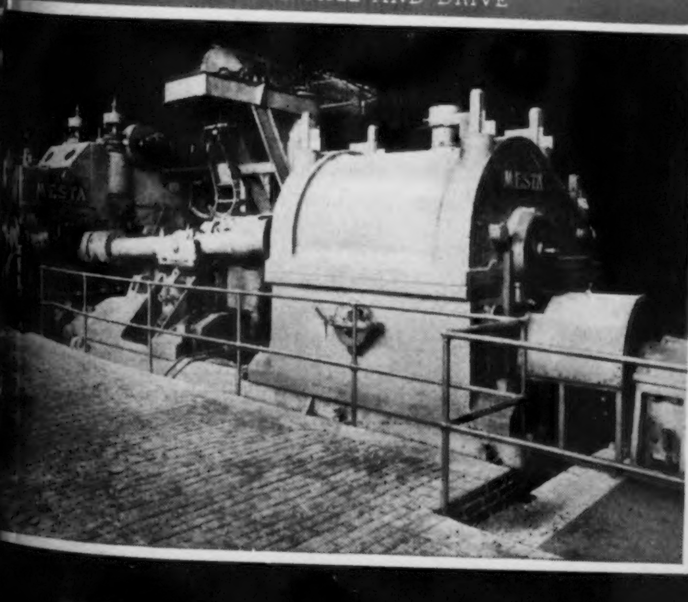
DISCHARGE END OF MESTA 42" CONTINUOUS ELECTROLYTIC TIN PLATING LINE

MESTA 29" STRUCTURAL MILL WITH TRAVELING TILTING TABLE

IGH-SPEED MESTA ECTROLYTIC EANING LINE



MESTA PIERCING MILL AND DRIVE



42" TWIN FOUR-HIGH SKIN PASS MILL FOR TIN PLATE

MESTA MACHINE COMPANY · PITTSBURGH, PA.

(CONTINUED FROM PAGE 254)

ammunition component castings has been good. Although the Alcoa 218 type alloy with 8 pct magnesium (Dolite) is more difficult to handle than other aluminum die casting alloys, it will probably be used to an increasing extent due to its excellent corrosion resistance, extremely high impact strength and high white polished luster. With the large capacity available for production and the vast quantities of cheap scrap, aluminum die castings are finding more consideration in production plans.

Multiarc Aluminum Welding

The multiarc welding process recently introduced for aluminum alloys is stated to give porosity free welds with an unusually uniform penetration. Double carbon electrodes are powered by alternating current while a heavily coated metallic electrode may be powered by alternating or direct current. Arcing therefore takes place between the metallic electrode and the carbons, from one carbon to the other, from the metallic electrode to the workpiece and from the carbon to the workpiece. The metallic rod is consequently imemdiately fused. The best results have been obtained with a heavy flux coated 5 pct silicon aluminum rod.

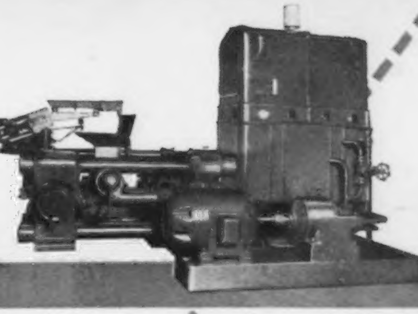
A satisfactory method for making composites of aluminum or aluminum alloys with carbon, alloy or stainless steel or cast iron has been developed. Steel-backed aluminum bearings have shown fatigue properties superior to copper-lead alloys and a lower coefficient of friction than copper lead or indium plated lead silver bearings. Aluminum composites have been proved to have good heat conduction and should find use in many heat-dissipation applications. A most interesting proposed use has been for elevated temperature service in high-sulfur atmospheres where the aluminum will provide the corrosion resistance and the underlying stainless steel the high strength.

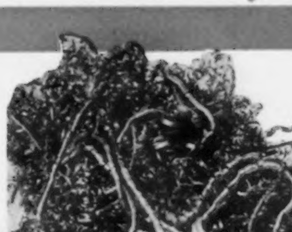
There has been considerable work on the grain refinement of magnesium-base alloys since a fine grain size is necessary for the best mechanical properties of castings. It has long been known that the grain size of aluminum-bearing magnesium alloys could be refined by superheating the molten alloy to about 1560° to 1700° F. However, this practice requires considerable time, thereby decreasing produc-

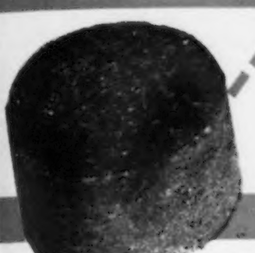
tion, and seriously shortens the life of the melting pots. Sometimes, for no apparent reason, the super-heating has not been effective on large melts. The knowledge of the mechanism of this refinement is still limited although the required times and temperatures have been determined fairly accurately. Alloys made from carbothermic magnesium have been reported to be fully refined at temperatures as low as 1400° F, which is lower than the temperatures necessary for electrolytic magnesium alloys. But this method of refinement is not very practical in view of the small production of carbothermic magnesium. Aluminum-bearing alloys made from both electrolytic and carbothermic magnesium may be refined without superheating by vigorous stirring at about 1400° F, but the refinement is generally not equal to that obtained by superheating. Bubbling acetylene or natural gas through the melt at 1400° F gives a grain refinement equal to that obtained by superheating.

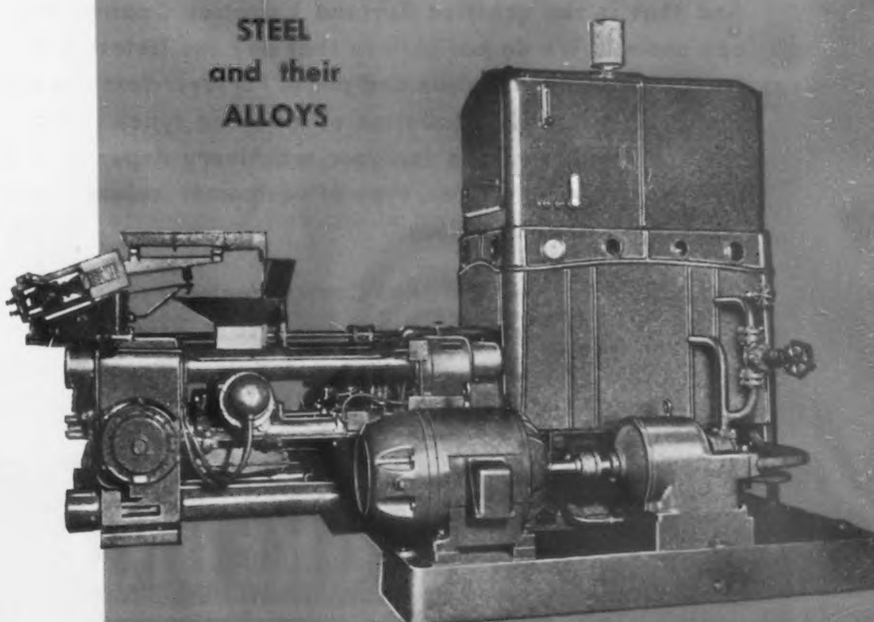
However, the most promising development for grain size control is carbon inoculation. A carbon addition of about 0.1 to 0.2 pct gives at least as fine a grain size and at least as good mechanical properties as superheating. The carbon may be added as a solid such as pitch coke or in gaseous form such as propane. Present indications are that aluminum must be present to obtain appreciable refinement by carbon inoculation but the same is true in normal superheating practice. It is claimed that carbon inoculation is less dependent on alloy content and casting temperatures and is less sensitive to other variations than superheating. Commercial application results have been excellent on heats up to 300 lbs. To date, no satisfactory procedure has been developed to give consistent and reproductive results on 4000-lb melts. The question as to whether bubbling of gas or the addition of solid agents or mechanical agitation or superheating is the best is a technological problem that can be settled only by plant scale operations with accompanying cost analyses.

Surface protection of magnesium and its alloys is still attracting interest. Some preliminary work has been done on nickel and chromium plating although the difference in potential will probably preclude any outdoor use of plated mag-









nesium. An anodic treatment has been developed which seems very promising. The coating is not quite as hard as the anodic film on aluminum alloys, but it is about a hundred times more resistant to abrasion than the standard Dow No. 7 treatment. The anodic coating is generally sealed by dipping into a dilute zinc-chromate bath.

New magnesium alloys introduced include a zirconium alloy with about 65,000 psi tensile strength, a heat-resistant cerium alloy and a tough ductile sheet alloy with 5 pct aluminum and 1 pct zinc.

Zinc as a metal or alloy, as opposed to its well established use as a coating, found relatively few war time applications. However, the good results obtained with zinc alloy dies in the aircraft industry for forming sheet metal will undoubtedly lead to its continued use in applications involving relatively short runs. Although the per pound cost may be higher than steel, these dies are usually produced by casting, thereby requiring less production time than machined steel dies. Furthermore, the zinc alloy can be entirely reclaimed by remelting, so the overall cost is low. Blanking dies made from rolled sheet have also been very satisfactory. Although the most important use of these zinc-alloy dies will probably be in the forming of metals, recent experience has shown that zinc-alloy dies can be used in compression and injection molding of rubber and plastics. Zinc alloys are more difficult to hub than steel, but they have the unique property of not sticking to the molded parts.

In 1940, automobiles had an average of about 45 lb of zinc diecastings per car in applications such as grilles, hardware and carburetor bodies. Wtih the resumption of automobile production, zinc diecastings are returning to their prewar figure of about 65 pct of all diecastings. A few of these applications may be taken over by aluminum and magnesium, especially if the price of the latter metals decreases sufficiently. However, at ordinary temperatures zinc has a high ductility and shock resistance that will be hard to beat, and the casting and finishing costs of zinc parts are considerably less than those of either aluminum or magnesium.

Research in recent years on nonferrous alloys made with electro-

lytic manganese has shown an astonishing variety of unusual electrical, hardness, corrosion and damping capacity properties which may be obtained with these alloys. Now, a series of hardenable copper-nickel-manganese alloys has been introduced commercially. An alloy with 60 pct copper, 20 pct nickel and 20 pct manganese is soft, ductile, can be easily hot or cold formed, and then hardened to 400 to 500 Vickers by a simple heating at 500° to 900° F. The hardening is not due to precipitation but is believed due to the formation of an ordered MnNi lattice. It is claimed that the hardening response is uniform and dependable and is not greatly affected by prior cold work or by a solution treatment. Springs and diaphragms made of this alloy have a very low drift and therefore may compete with beryllium copper parts. The alloy also has high fatigue strength and can be used as an electrical conductor provided the current density is not exceptionally high. In the soft condition, the alloy has a slightly negative temperature coefficient of resistivity, while the hardened alloy has a slightly positive coefficient. Intermediate hardening conditions can be selected to give a zero coefficient for any particular temperature range. This alloy is also recommended for use in bourdon tubing and temperature or pressure responsive bellows.

Low-Tin Alloys May Survive

Some of the low-tin lead babbitts have proved very satisfactory as bearings. However, they are not as corrosion resistant as the tin-base alloys and may not stand as hard pounding unless used in the form of a thin bearing. It appears likely that some of these will continue to be used even when tin becomes more plentiful. Shortage of cadmium has led Ford to adopt a tri-alloy bearing with about 40 pct lead, 5 silver and 55 pct copper. The bearing is deposited on both sides of a low-carbon steel backing strip to make a double-face floating-type bearing. The silver addition prevents the segregation of the lead. The bearing-wear factor is about the same as for cadmium bearings with the crankshaft journal showing a little more wear when the tri-alloy is used. The principal advantage of the new

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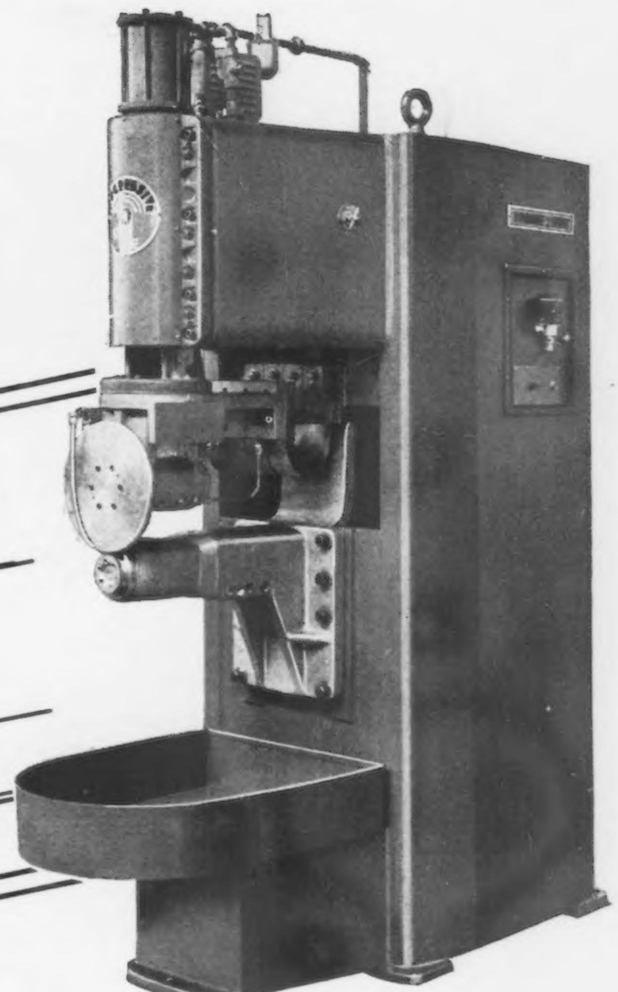

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bearing is its ability to stand up under heavy loads at high speeds. The bearing is more expensive than the cadmium type, but this differential may be decreased with increasing experience.

Copper and its alloys are unquestionably regaining many of their prewar uses. However, until the tin shortage is relieved, downgrading of the tin bronzes will continue. Some of these lower tin alloys are giving such good service that they seem likely to be retained even when tin is plentiful. The 88 pct copper, 8 tin and 4 pct zinc alloy appears to be gaining in popularity over the old 88 pct copper 10 tin and 2 pct zinc alloy while the G type with 87 pct copper 10 tin 1 lead and 2 pct zinc is being replaced rather generally by the 85 pct copper 5 tin 5 lead and 5 pct zinc alloy and the M type with 88 pct copper 6 tin 1½ lead and 4½ pct zinc. The greater availability of nickel in the past few months offers the possibility of replacing tin in the copper alloys either partially or totally with nickel. The Navy has proposed a specification for gun-metal bronze with 4 pct tin replaced by nickel as they found the nickel alloy to have higher strength, better castability and equal sea-water resistance. The change to non-tin-bearing copper alloys such as yellow brass, silicon bronze, aluminum bronze and manganese bronze has necessitated many revisions in foundry practice. The progress in this field has been considerable. The longer the tin shortage is prolonged and the more experience is gained with these alloys, the more likely it is that these tin-free copper alloys will retain many of the advances they have made.

Vacuum melting is a comparatively rare method even in the laboratory. However, there has been an interesting application of it to produce oxide-free gas-free copper castings of great purity for anodes in X ray tubes. A graphite mold with a copper ingot is placed in an induction furnace which is then evacuated. When the copper is melted, it runs down into the mold. The final product is a copper anode, 3 to 5 in. long and up to 2⅝ in. in diam with a tungsten insert for the target.

During the year, various reports on the state of German industry have aroused considerable interest. There were numerous German met-

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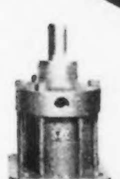

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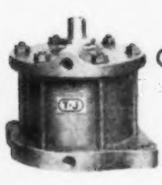

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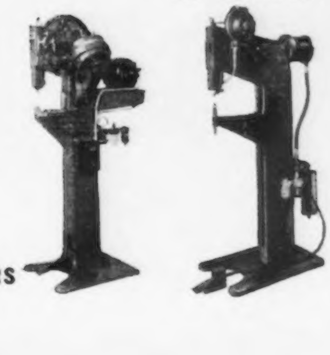

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allurgical innovations which seem to have been chiefly dictated by scarcity rather than by the desire for improvement. The German substitute sintered carbides developed due to the tungsten shortage do not appear too promising. Sintered aluminum carbide was effective in light cuts on nonferrous metals but on the whole it gave dismal results. Tool tips of 45 pct titanium carbide and 45 pct vanadium carbide with 10 pct nickel or 7 pct nickel and 3 pct cobalt were used. This titanium-vanadium carbide was somewhat better than the aluminum carbide, but production tests showed it to be brittle with a tendency to chip easily and to break down when taking anything but light cuts.

However, hot pressing of carbide powders is one of the new fields in which the Germans have developed practices to a higher degree than we had. It has long been known that hot pressing has many advantages; practically pore-free compacts may be obtained. Hot-pressed iron powders, for example, have mechanical properties far superior to those of cold pressed and sintered iron powders. But in this country it has been felt that the temperature, time and pressure requirements were too severe for commercial practice except for the production of very large objects or for a limited number of pieces of intricate design. The Germans brought the hot-pressing method to a high state of perfection, possibly because their substitutes for tungsten carbide gave much better results when they were hot pressed. One of the chief difficulties in the past has been with the excessive wear of graphite dies and plungers. The Germans overcame this by pressing thin walled cylinders broached from graphite into heavier graphite mold containers, in a graphite resistance hot press. The thin walled cylinders could be replaced after use with a minimum discard of reclaimable graphite.

The increase in manufacturing facilities in this country for tungsten carbide as the result of the greatly increased use of sintered-carbide tools and dies as well as the production of sintered-carbide armor piercing shell cores has enabled the extension of tungsten carbide for other uses. The high wear resistance of tungsten carbide makes it a logical choice for machine parts subject to considerable wear. Sintered carbide has been

used for cams both in the form of small inserts and as entire cams. The ability to make long strips of tungsten carbide by cold extrusion makes it a possible choice for ways or slides of machine tools. The improvement in wear resistance increases the life and accuracy of the machine. Promising results have been obtained with experimental ball and sleeve bearings of sintered carbide. The excellent performance of carbide to carbide bearings has refuted most of the popular bearing theories which involve a soft bearing in contact with a very hard metal shaft.

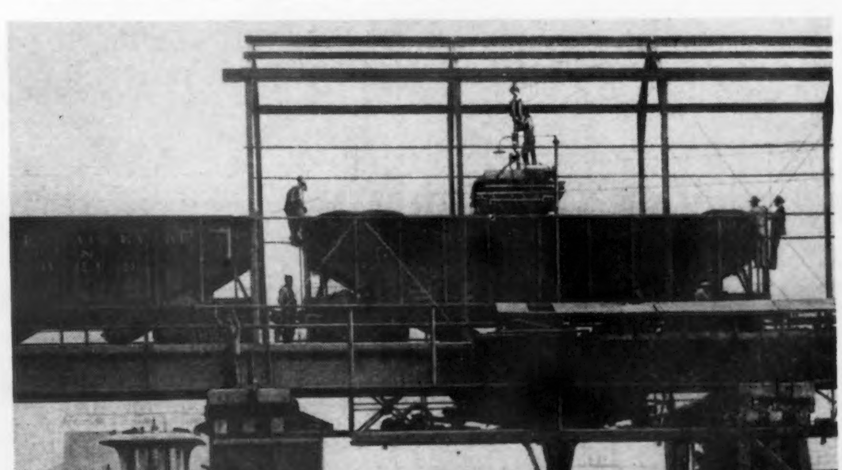
Many inspection devices based on electrical and magnetic characteristics have been introduced in recent years. The use of X ray and gamma-ray inspection has expanded widely especially in the development of foundry techniques. A new contender in this field is the supersonic reflectoscope which probes the interior condition of a piece of metal by sending supersonic sound waves into the part and observing reflections from the boundaries of the part or from any flaws within it. It seems to be satisfactory for determining internal soundness, flakes, average grain size, flaws, laminations and defective bonds. Ten or twenty feet of sound metal can be penetrated if its grain size is not too large but the surface must be flat and relatively smooth in at least one spot for the crystal. It will detect flaws too thin for X ray and too deep for Magnaflux, such as flakes in billets and forgings. Industrially it will probably be of most value in discovering defects of very small thickness yet of considerable extent laterally. As the limitations of each of these devices become better known, each will find its own field of use, and combined with proper sampling procedures and a statistical analysis of the results, will ensure the purchaser a much sounder material and a greater factor of safety.

An interesting technique for making micrographs of metal by X ray diffraction has been developed. These micrographs show concentrations of inhomogeneous strain as well as the sizes and shapes of polycrystalline grains. The preliminary work on the effects of age hardening, cold working, recrystallization and the imperfections of cast alloys has shown many potentialities.

Acknowledgments

The author is grateful to the executives of the Crucible Steel Co. of America for permission to print this paper. Sincere thanks are due to the many people who have been of assistance in the preparation of the paper, particularly Messrs. J. C. Fox and H. A. Campbell.

A NEW MACHINE *to speed the unloading of coal cars is pictured on top the car as the equipment was tested in Charleston, W. Va. The car shaker was designed and built by Robins Conveyors, Inc., Passaic, N. J., manufacturer. The average car can be unloaded in about two minutes.*



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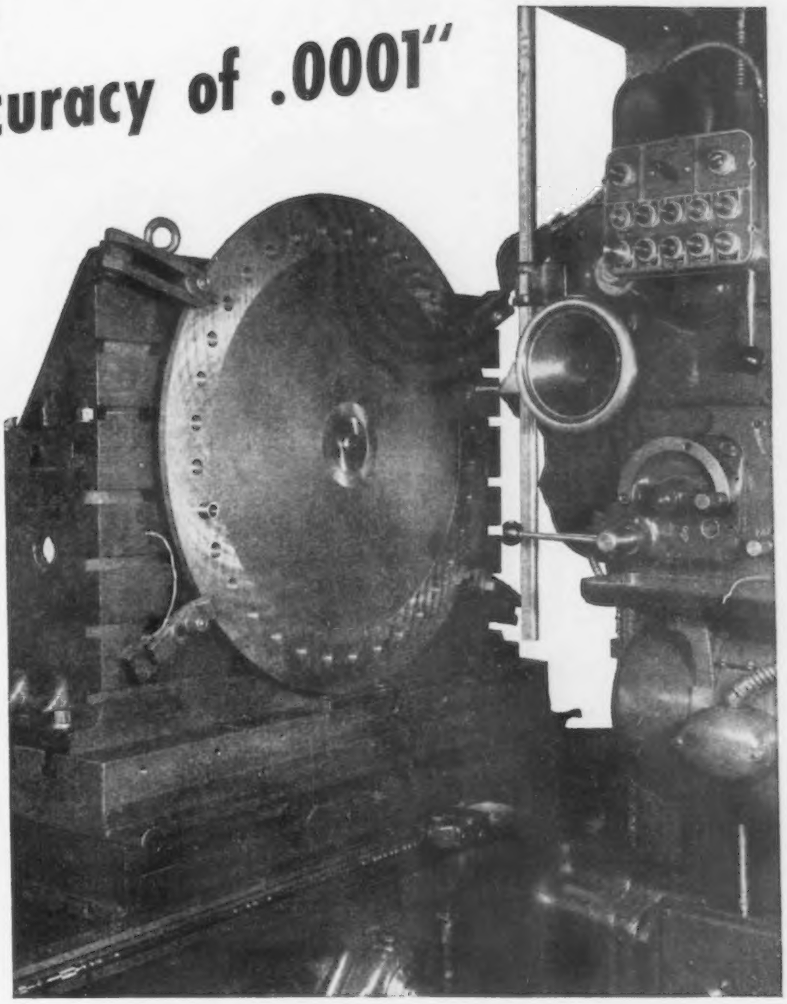

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Foundry

(CONTINUED FROM PAGE 145)

sible to obtain by any other met hod than precision casting.

Hascrome, a chromium-manganese-iron composition, has been developed for the making of parts where outstanding resistance to abrasive wear accompanied by severe impact are encountered. Another alloy developed especially for high-temperature applications, and one which offers an unusual combination of physical, chemical and mechanical properties for parts that will be subjected to the toughest service, is Multimet (M-155). The stainless steels, Nos. 316, 310, 347 and 410, have all been precision cast, and gray-iron precision castings are being made by the Cleveland laboratory of the Meehanite Research Institute.

Next to interest in types of metals peculiarly adaptable to precision casting, attention should be directed to the array of parts used in radar, where the emphasis is on intricacy of shape. The precision method has made for itself a record equally imposing as that for the turbosupercharger buckets, but fabricators are still reluctant to divulge the story.

Improvements in production is a factor that will strengthen the competitive position of precision casting generally. An outstanding example in this direction is the increased use of plastic extrusion machines for making patterns having great stability to abrasion and mechanical shock as compared with wax. Where the amount of pieces warrant the making of a die in a plastic extrusion press, it has been found that plastic patterns are economical. The great care that is used in handling wax patterns, of course, is not necessary in the case of plastics.

Striving for greater accuracy in reproduction, wax and other materials that serve as patterns are being carefully studied. Some new developments during the past year are the use made of low-fusible alloys and of mercury. In utilizing mercury, deep-freeze techniques help in forming the pattern and induction heat is used for melting out the mercury from the investment.

Metallurgical analysis of castings has brought out how important is the actual injection of the hot metal into the mold. This has led to the study of casting machines to see how they have affected grain structure. In the case of steels, it was the experience of one large fabricator to design a centrifugal-casting machine which permitted a relatively slow pour at the beginning to be followed by packing of the metal as centrifugal speed increased. When the metal was permitted to crash into the mold by the use of the earlier machine, non-homogeneities were found to occur, especially when casting ferrous parts. One method used to achieve a smoother introduction of the metal into the mold is that of having a centrifugal casting apparatus which revolves about a horizontal axis, and to reduce metal oxidation flask and crucible are both revolved in a vertical plane.

There has been much debate on the tolerances possible by this method. Some of the claims on tolerances made by operators have been criticized by others as not being sufficiently specific. The yield of satisfactory castings is directly proportional to the tolerances allowed on the castings, and the actual tolerances to which castings can be held depend upon the size and contour of the part. Definitions of tolerance standards is needed badly in the commercial precision-casting field.

Covers Powder Metallurgy

Philadelphia

• • • **Walter J. Baëza**, president of the Industrial Research Co., New York, and author of the book "A Course in Powder Metallurgy," addressed the Philadelphia Chapter of the American Institute of Chemists.

He stressed the fact that although probably less than 50 tons per day of metal powders are fabricated into usable products now, the impact of these few tons on our economy, is enormous.

Tungsten wire saves the American public $3 billion per year on its lighting bills. Carbide tools save from 20 to 60 pct in man-hr cf machining. Radar and electronic equipment is inconceivable without products produced by this technique, he said.

Parts smaller than a zipper tooth which are produced at a rate exceeding 100,000 per hr, or parts up to 60 and 100 lb each are made by powder metallurgy with unique qualities.

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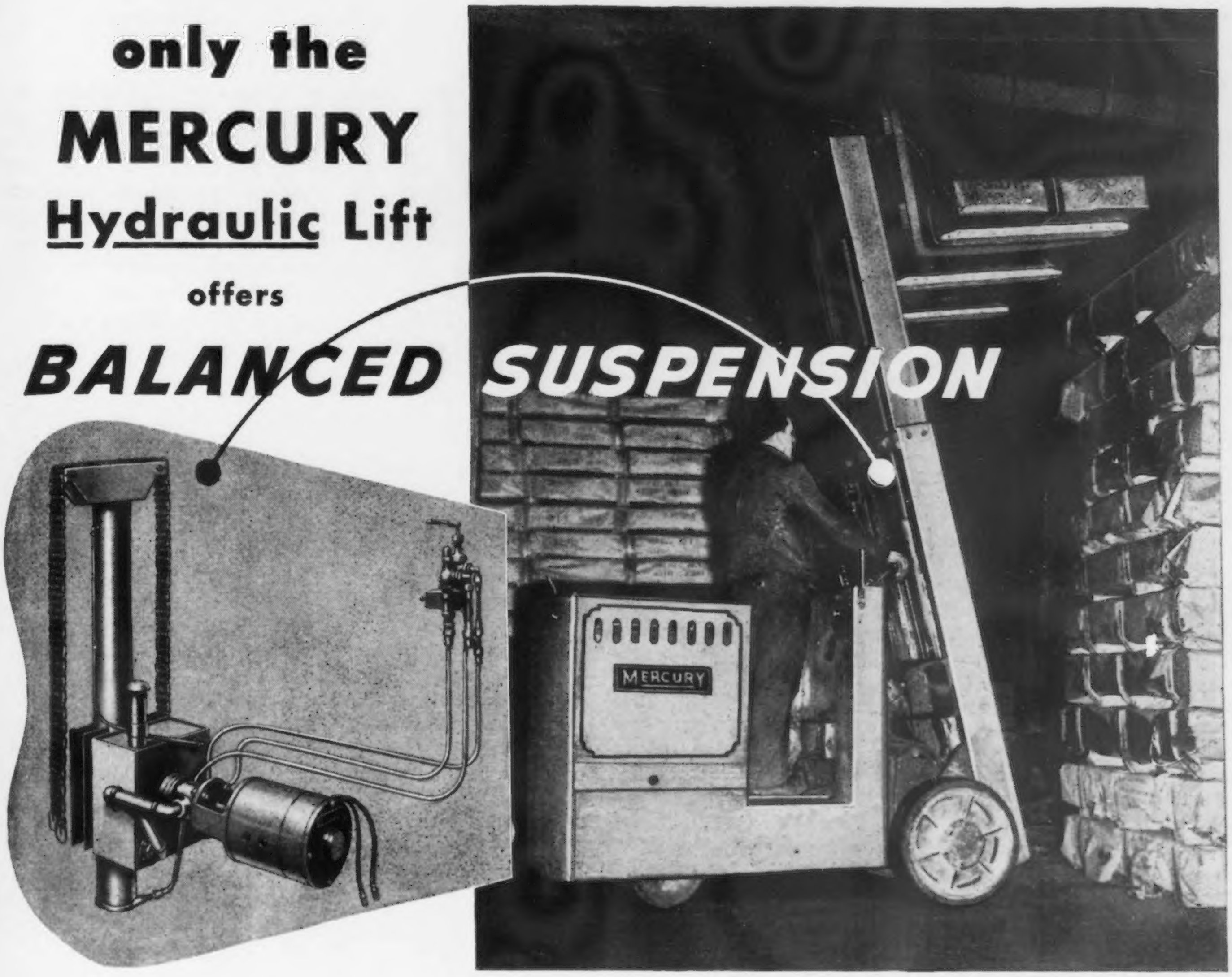

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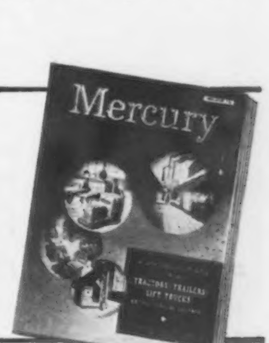

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Ore and Coal

(CONTINUED FROM PAGE 149)

research on low grade ore concentration continued during 1945 and at the Minnesota Mines Experiment Station at Minneapolis, at the Battelle Memorial Institute, Columbus, Ohio, and at commercial ore laboratories as well. At Duluth, the Oliver Mining Co. has been installing equipment necessary for comprehensive experiments on the entire problem of iron ore processing. Most of these research programs include studies of both the improvement of present methods of beneficiation and the concentration of the so-called "taconites," both magnetic and nonmagnetic types.

In this regard, it is hardly necessary to point out that the "long-look" future of the Lake Superior district depends on the success of the operators in this "taconite" enterprise—whether they can produce from hard, iron-bearing rock containing 25-35 pct iron satisfactory blast furnace fodder at a low enough cost. Operators anticipate success in this endeavor, but there are hurdles to be cleared before the final objective is reached.

SOME indication of local interest in Minnesota's future can be had from the recent action of the Iron Range Rehabilitation and Resources Commission, maintained by a part of the Minnesota Occupation Tax on iron ore, in approving the expenditure of $300,000 for an experimental powdered iron plant on the Mesaba, using carbonate ore in a process developed by Prof. C. V. Firth of the University of Minnesota, and an expenditure of $25,000 for a pilot plant for drying and processing peat for fuel, based on possible utilization of the enormous quantities of this material in future roasting of nonmagnetic taconite and for other purposes. This commission has also undertaken another $25,000 project, the proposed diamond drilling of a large outcrop of magnetite in Cook County; funds will be spent by the State Geological Survey.

Experimental work with the same general objective is being carried on elsewhere. Jones & Laughlin Steel Corp. in New York in the form of experiments on the problem of recovering martite, nonmagnetic ore, from mixed ore bodies; in Pennsylvania, the Defense Plant Corp. project for mining, washing and concentrating limonite at the Scotia property was put into operation for a short time during the summer; and in Alabama, a new concentrating plant for roasting and magnetic separation of the more siliceous red ores at the Ruffner mine of Sloss-Sheffield, Birmingham, was put into operation in late 1945 and is expected to reach full production soon. Beneficiating the South's siliceous ores is a problem of comparable importance to this district as that of "taconite" to the Lake Superior ranges. A study of the "gray" metamorphic hematite-magnetite ores of the Telledga County district is being made by the Bureau of Mines. Other than reports of some diamond drilling, results of this study have not been made public.

At Granite City, Ill., a new crushing plant and belt conveyor to the mill bin have been recently installed to handle hematite concentrate produced by the Ozark Ore Co. at Iron Mountain, Mo.

KNOWN Mesaba reserves of present commercial-grade ores, at the beginning of 1945, were reported by the State Tax Commission at about one billion tons, of which 600 million tons are classed as open-pit reserve and the remainder as recoverable by underground methods. Chart B, which shows the wartime output of Mesaba, indicates why the industry is so keenly alert to the problem of future ore supply. However, it should be pointed out that present measured reserves for taxation are not likely to be all the ore that future mining, exploration and development will reveal. Past experience indicates that each year considerable new tonnage is added, offsetting, in part, the depletion from the year's shipments and extending the life estimate that might be obtained by merely dividing current reserves by expected annual output.

(CONTINUED ON PAGE 288A)

Outlines Fundamental Responsibilities Of American Industry

By IRA MOSHER
Chairman of the Board, National Assn. of Manufacturers

New York

• • • **I can report that,** despite many problems to be faced and solved, the outlook for industry and business pitfalls along the way and knotty problems to be faced and solved, the outlook for industry and business (and the nation) is good not only for 1946; it is excellent for the years ahead. But, what I see is more than just better days; it is an opportunity.

In my opinion, we stand today at a great milestone in the nation's history. From here out, we of industrial management have the privilege of taking the lead in showing the world, as well as the doubting Thomases at home, that a nation of free people and free enterprise can produce as fully and as effectively for peace as it can for war. It is a privilege, created by the will and the needs of the people, for which we must be humbly grateful.

I, therefore, think the time is particularly fitting for all of us to take stock of the basic responsibilities which we seek to discharge and of the guide rules by which we work.

(1) Our basic responsibility is to promote a steady rise in the American standard of living. We work for an ever-increasing volume of goods and services, of better quality, produced at lower unit costs. We thus foster, encourage and participate in scientific advancement; strive for the maximum in technological improvement and increased efficiency; and seek improved and cheaper methods of distribution. We make every effort to secure equitable division of the increments of progress between the public—through lower prices; our employees — through increased wages; and capital—through fair returns on investment and legitimate rewards for risk-taking.

(2) Our basic standard of conduct is competition. Freedom of enterprise is indispensable to the nation's welfare. Enterprise cannot remain free without competition. With full and effective competition, free enterprise insures the highest standard of living that people can enjoy on this earth. We thus reject all forms of monopoly, vested interests, and special privileges. We support the active and full enforcement of antitrust and fair trade practice laws.

(3) The right to work is a basic right. We are committed to the principle of full employment, and will bear our full share of responsibility for establishing and maintaining those conditions under which it is possible. We respect the dignity of American workers; have faith in their loyalty to the American system of free enterprise; and are confident of their fundamental desire to give a full day's work for a full day's pay. We devote ourselves to providing the best possible working conditions and the highest possible wages, consistent with equity to the public and to investors, for all employees—organized and unorganized. We honor the right of employees to organize and bargain collectively, and we engage in collective bargaining with freely authorized representatives of employees in good faith and all sincerity. We are against inbred leadership. We will keep the stairways of opportunity open so that all employees may advance in accordance with their ability, integrity, ambition and industry.

Leaders of industry and business are in truth carrying the torch of liberty for all the nation's people today. For, as was so clearly seen by our founding fathers, the basic freedom from which all other freedoms flow is freedom of enterprise. Through our leadership, the nation can have full production — full employment — and freedom. If we keep our faith and our courage high, as I know we will, the conditions of the 1930's need never return to this land. This is our opportunity. We are ready and on our way.

Welding

(CONTINUED FROM PAGE 141)

of sufficiently flexible machine adjustments or physical limitations. This means that spots currently made on 0.012, 0.016 and 0.020, for instance, usually are six or more times the sheet thickness in diameter, which is undesirable when considering either efficiency or strength. A large number of spots having $d = 4h$ consistently should produce a more efficient joint with less buckling and with less effect on the heat-treated structure of the parent metal.

On the other hand the thicknesses which lie toward the upper end of the welding range of a machine are generally at best 3.5h in diameter because the maximum pressure, current and time available are too low for optimum conditions. This means that such spots are made at a low efficiency, all factors considered. The penetration of the slug and its surrounding heat-affected zone, not only is such that the metallurgical quality may be inferior to that of an optimum weld, but also causes heat penetration nearly to the surface of the material so that pickup on the electrodes may be quite severe. Also the separation of the sheets and the faying surfaces surrounding the weld may become difficult to control. Strength consistency is usually inferior to that of optimum welds and a tendency to expel metal from between the sheets often results. In addition, welds spaced at a normal distance will show a marked tendency for the second and succeeding welds to have a lower shear strength than the first, a condition which is of little or no consequence for optimum welds.

Stainless and Nonferrous Welding

Considerable work has also been performed on the spot welding of magnesium alloys, since this method of fabrication does not add to the weight of the finished structure. Considerable trouble has been experienced in obtaining sound welds because of the difficulty of producing a truly clean surface. A chemical cleaning process, however, has now been worked out that is superior in many respects to wire brushing, and which has made it possible to produce welds with greatly improved shear strength.

The spot welding of aluminized steel has also come in for considerable attention, and while this is ordinarily a difficult material to weld, recent investigations have shown that with proper pressure and current, and with the use of properly shaped electrode tips, welds averaging 1800 lb shear strength can be obtained. The most desirable combination of tips has been found to be a 2-in. radius on both top and bottom, but curiously, the cleaning of the surfaces has little effect on the weld strength. Uncleaned surfaces tend to produce slightly more pickup on the electrodes, necessitating somewhat more frequent dressing, and expulsion of the aluminum coating from the joint is somewhat increased, but slightly higher strength is obtained from an uncleaned joint, possibly because of the higher heat generated at the interfaces of the sheets because of the increased contact resistance.

Stainless steel has always been a difficult material to cut with the acetylene torch because the very elements which give this material its desirable properties produce extremely tenacious oxides. When attempts are made to cut stainless with oxygen, the slag produced is very viscous and tends to form a refractory layer which prevents heat and gases from reaching fresh layers of material. This difficulty has now been overcome by the use of a flux fed into the oxygen line, whereby stainless steel may be cut with almost the same ease as mild steel.

The question as to whether or not stainless steel weldments should receive a stabilizing and stress-relieving heat treatment has come in for considerable discussion. Recent experiments to determine whether any benefits might be imparted by such treatment of types 347 and 321, such as are used in exhaust manifolds,

have indicated that while there may be some slight increase in the ability of such heat treated material to resist corrosive aqueous solutions, there is no indication that the process will increase its resistance to intergranular attack by exhaust gases at elevated temperatures. From a manufacturing standpoint this conclusion is highly important, since the heat treating necessarily adds considerably to manufacturing expense. The scale formed at the heat treating temperature of 1600° F is very tight and thin, and its removal by the usual acid pickling solutions is not readily accomplished. This results in added costs because of the sandblasting or special pickling solutions that must be used. Furthermore, it would be necessary to increase furnace capacity for heat treatment at this temperature for a minimum of ½ hr in place of the usual 10 to 15 min annealing time.

Considerable advance has been made in the techniques of flash welding, particularly in reference to its application to the welding of alloy steels. The demand for alloy steel rings of large diameter for bearing races, coupled with the shortage of forging capacity, made it imperative to develop some method of producing these without the waste of time and material involved in punching or flame cutting from sheet or forging from a pierced ingot slab. Some of the steels used for this purpose were so high in carbon as to be considered practically unweldable, but careful research has shown that with proper precautions and control alloy steel rings of almost any size can be produced by flash welding to within close limits of accuracy and without serious disturbance of the metallurgical structure.

Some interesting developments have also taken place in the flash welding of copper alloys, and methods have been worked out whereby sheet brass, contrary to common belief, can be flash welded with consistently good results. The process is in effect a combination of butt and flash butt welding, whereby the parts are brought into contact before the passage of the current, but under a light constant pressure, so that during the time of current flow only a short flash takes place. Developed originally in England, this process should prove very valuable for welding rods, sheet edges, and shapes, provided proper machines are made available and proper care is taken in the process.

It is of interest to note that, with the development of rural electrification, farms are now offering an entirely new market for small, inexpensive welding outfits. Used particularly for repairing farm implements, these sets will be sold by mail-order, and should form a substantial volume of new business for the manufacturers of machines and electrodes.

All in all, the outlook for the welding industry in all of its various branches is decidedly healthy, although the electrode market for some months has been feeling the effects of surplus stocks. Fabricators who, during the war, made a practice of keeping several months' supply of electrodes on hand, found that with reduced operations these stocks were disproportionately large. Enormous quantities were disposed of as scrap, and finding their way into dealers' hands, still in the original packages, threatened for a while to swamp the market at absurdly low prices. This situation has just about cleared up now, and there will probably be little more trouble from it.

Surplus welding machines have not been appearing on the market in any great quantities, and it is rather doubtful that they will affect the sales of new machines to any great extent. Buyers on the whole are apt to be somewhat skeptical of machines that have had considerable use and that do not carry a manufacturer's guarantee. It seems quite likely, therefore, that the greater part of the surplus will be bought up by the original builders, reconditioned, and sold as rebuilt and guaranteed equipment.

Welding of stainless steel has received considerable impetus through the application of Heliarc welding. Already well established as a means of welding aluminum and magnesium, the process employs a single tungsten electrode surrounded by an atmosphere of

monatomic gas such as argon or helium. The purpose of an inert gas is to eliminate the need for a flux and to prevent chemical change of those constituents in the alloy which would combine with oxygen, hydrogen or nitrogen at fusion temperature. Helium was originally used for the protecting atmosphere, but its low atomic weight resulted in a high rate of dispersion and necessitated the use of a large volume of gas to keep the molten metal area shielded during welding. Argon, being considerably heavier, is more economical to use and is rapidly replacing helium.

The tungsten electrodes used for welding stainless steel are not materially consumed during the operation, and there is, therefore, no danger of carbon pickup. Carbon electrodes could be used with a dc welder, but there would be considerable danger of carbon pickup which is particularly undesirable where stainless steel is concerned. With the tungsten electrodes either ac or dc may be used, but with ac the use of superimposed high frequency current is recommended because of its arc stabilizing effect. This superimposing of high frequency current on standard frequency alternating current has been one of the developments which have contributed largely to making possible the increased application of Heliarc welding to stainless steel, since it permits the making of clean, spatter-free welds.

With dc welding it is essential that straight polarity be used (negative electrode), and here again superimposed high frequency current is desirable since it permits an arc to be struck without contact with the steel, thus avoiding electrode fouling.

High operating speeds are attainable on both stabilized and unstabilized material, weld beads are smooth and can be made with minimum reinforcement, and final polishing operations are thus speeded up. It seems probable, therefore, that this new welding technique will still further broaden the many uses of stainless.

Survey Shows Postwar Canadian Industries Exceed Prewar Level

Ottawa

• • • **The Reconstruction** Dept. in a survey states that basic Canadian industries which showed large wartime expansion are going to emerge in the postwar period larger than before the war, but somewhat below their war peak. Conditions will vary in different industries and in some extensive layoffs are considered inevitable in the conversion period. In broad terms the outlook:

Steel—Peacetime demand will be somewhat below the full war capacity.

Aluminum—Large cuts likely but the final postwar status will depend on domestic and export markets.

Nickel—Will probably require from two-thirds to three-quarters of peak employment.

Chemicals—Only a limited part of the war expansion suitable for postwar and limited employment.

Automotive—Good prospects for the next four or five years once conversion is completed.

The survey states: "The munitions, aircraft and to a lesser extent, the shipbuilding industries, are difficult to convert from war to peace; the automobile, metals and miscellaneous industries group are, on the other hand, fairly readily convertible. In munitions, aircraft and shipbuilding, where marked wartime expansions occurred, substantial declines in employment were registered as war contracts were terminated during the changeover to peacetime conditions. During the period May 1, to Oct. 1, 1945, employment in those firms classified as producing munitions declined from 63,000 to 20,000, while employment in the aircraft industry declined from 59,000 to 18,000 and in the shipbuilding industry from 64,000 to 44,000.

"The long-term outlook of the iron and steel industry hinges largely on the prospects of such major users as railways, automobiles, industrial machinery and construction.

"In aluminum, which multiplied six times during the war, the department found prospects of a large cut in the war employment.

Finishing

(CONTINUED FROM PAGE 135)

position was recommended for the high pH stabilized indium cyanide bath:

Indium ......15 to 30 g per liter
Potassium cyanide
140 to 160 g per liter
Potassium hydroxide
30 to 40 g per liter
Dextrose .....20 to 30 g per liter
Current density
15 to 30 amp per sq ft
Temperature ....Room
Anodes ....Steel

This bath is easy to prepare and is considerably more stable than the cyanide bath. The plate possesses a white color from either a fresh or an old solution. The cathode efficiency decreases with increased current density.

Continuous plating of fine steel wire with nickel was successfully effected by James H. Connolly and Richard Rimbach. A nickel-plated steel wire was developed to replace solid nickel wire for tungsten filament supports in incandescent lamps. The steel wire passes through a concentrated Watts' nickel plating bath at the rate of 12 ft per min (90 mm per sec) at a current density of 200 to 600 amp per sq ft (22 to 65 amp per sq dm); bath pH was 2.0, and bath temperature 140° F. A very adherent nickel deposit (0.005 mm) was obtained that could be safely subjected to sharp bends and which satisfactorily protected the steel basis during the life of the lamp.

High speed alkaline tin plating was done by Martin M. Sternfels and Frederick A. Lowenheim of DuPont. The potassium stannate solution promises to overcome a major objection to alkaline tin plating; the inherently slow plating speed obtainable with the sodium stannate bath. It possesses other minor advantages over the sodium bath as well, including greater freedom from sludge formation, better conductivity, and more favorable solubility relationships.

For the highest plating speeds at the extreme current densities considered, accurate control over anode current density and dragout is essential to avoid unbalanced operation and excessive loss of valuable solution. Such practice appears to be commercially suitable only for mechanical lines or in automatic equipment where such factors can be maintained. Where these conditions cannot be met it would be far safer to limit the concentration of the solution to about 12 oz per gal of tin, and the cathode current density to not over 100 amp per sq ft. Even this more moderate range represents a two or three-fold increase over customary procedure.

The potassium bath shares with the sodium bath the advantages of alkaline over acid solutions, including greater ease of control, better throwing power, less necessity for utmost care in cleaning, lack of need for rubber or lead-lined equipment, and possibly better quality of deposit.

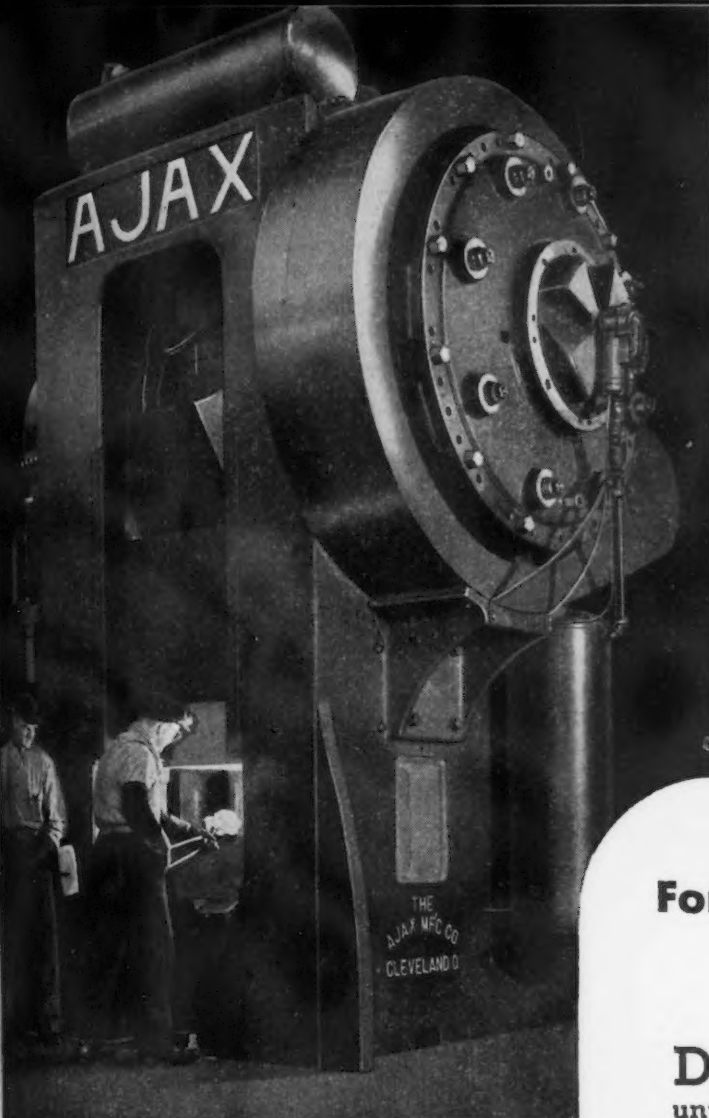
The deposition of metals from fluoborate solutions was recommended by Harold Narcus. In the past, the successful deposition of the various metals from the metalliferous fluoborate electrolyte has been limited to the electroplating of lead, lead alloys and indium coatings. However, with the present availability in the chemical market of the so-called "solution concentrates," which contain the metallic fluoborate in a concentrated form, the electrodeposition of the other common metals, such as tin, cadmium, zinc, copper and iron in addition to nickel, chromium and silver, is now feasible. These "concentrates" are presently commercially obtainable as approximately 40 to 50 pct solutions of the metal fluoborate in water in addition to small percentages of free fluoboric and boric acids. This eliminates the necessity for handling hazardous hydrofluoric acid by the operator and the subsequent dangerous procedure of reacting boric acid with hydrofluoric acid.

Black Finishes for Steel

Black finishes for steel were described by H. Silman. The problem of obtaining a really good black finish for iron and steel parts is difficult and has not yet been fully solved. However, the black coating is still, in some ways, utilitarian and attractive.

The four main types of black finishes used are:

(1) Oxide coatings formed on the iron surface by oxidation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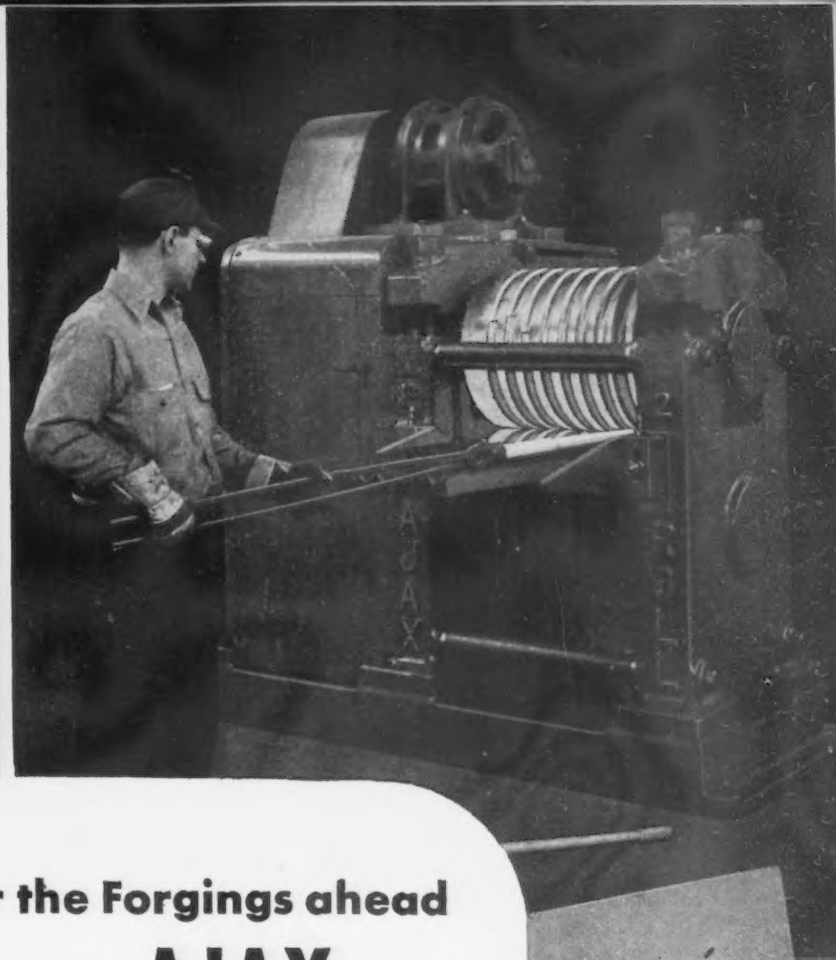
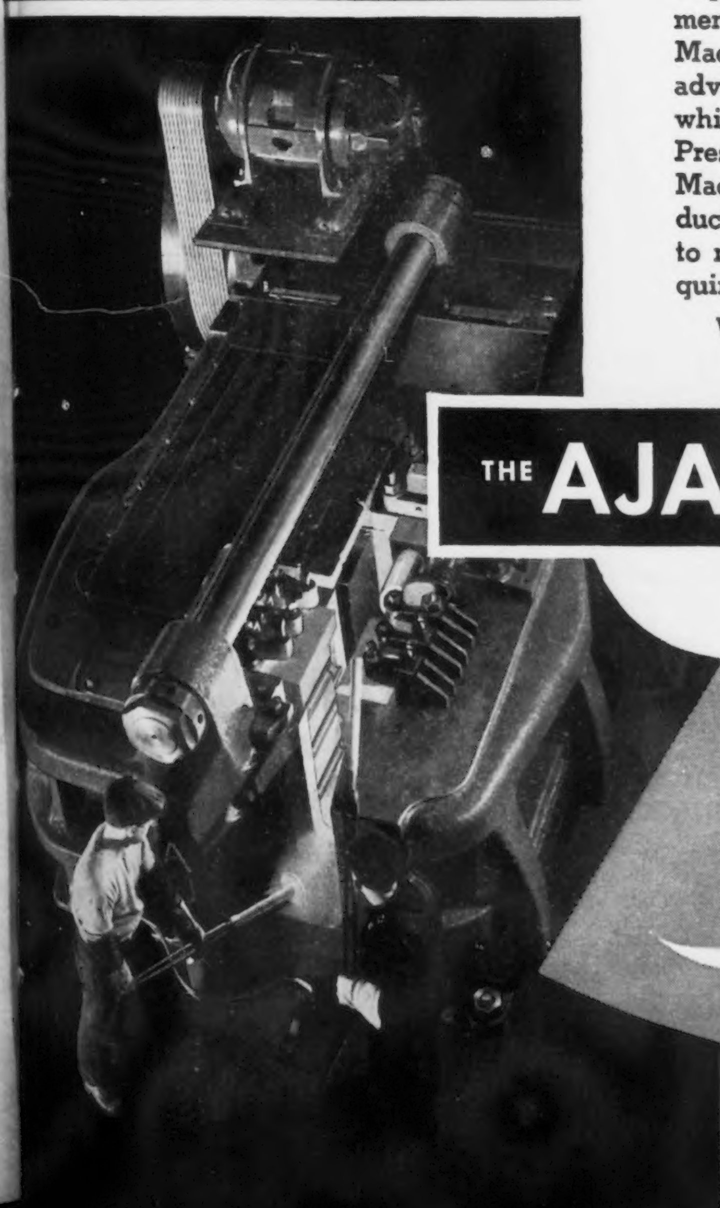
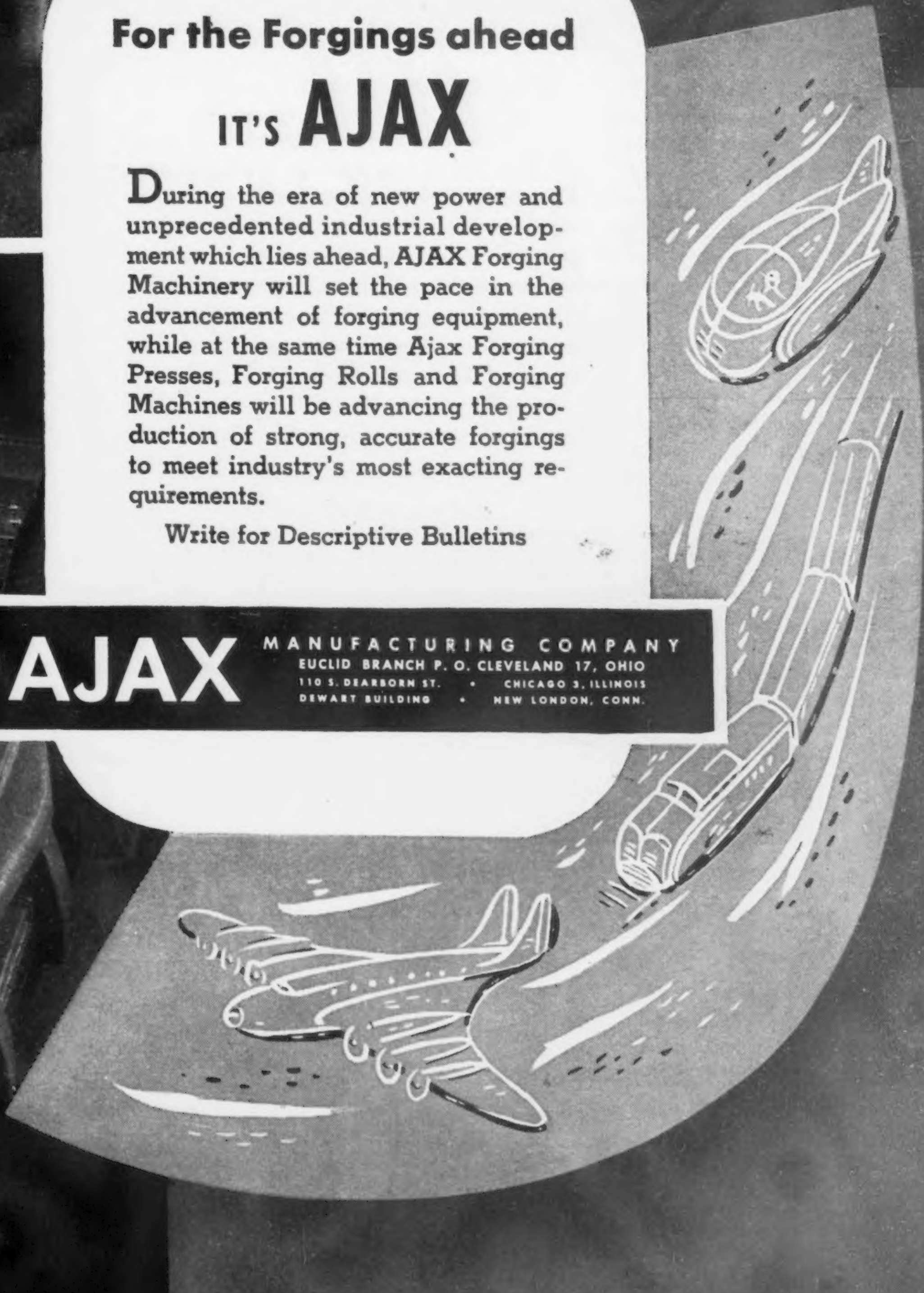






methods, caustic alkali-nitrate, etc.

(2) Phosphate coatings suitably stained and impregnated.

(3) Black electrodeposits; black nickel or coatings of other metals, such as copper, colored black by chemical means, molybdenum-nickel deposits, etc.

(4) Black organic or enamel finishes.

(5) Temper colors, produced by heat.

J. D. Devons discussed the importance of good metal stamping technique as a preliminary to the production of good electrodeposits. He gave a short description, first, of some of the defects or conditions in metal sheet and strip which cause trouble during plating and, second, of shop operations, and how these influence the product from the viewpoint of the electrodepositor to whom it is passed. Among the defects in metal mentioned were wrinkling and puckering, scoring, and poor surface finish. The author also discussed shop tools, drawing lubricants, interstage annealing, critical strain, crystal growth and accidental damage.

Bright dipping was gone into by Gustaf Soderberg, who defined bright dipping and reviewed existing bright-dipping processes for copper and its alloys, cadmium plate and zinc plate, magnesium and lead. Applications were listed and discussed. He also proposed a theory of bright dipping, paralleling that for anodic brightening.

Electrochemical processes are important in the manufacture of electronic devices, according to A. Korbelak. The unusually large variety of metals and non-metals used in the manufacture of electronic devices has resulted in demands for the increased use of electrochemical methods in the processing of such materials. A detailed review of such methods was presented, including a description of the electrostatic coating of glass tubing, an outline of a processing laboratory and a survey of the electrodeposition baths employed, listing compositions, operating conditions, results, etc.

Foreign Reconstruction . . . (CONTINUED FROM PAGE 163)

the restoration of normal peacetime pursui s, as far as the universal coal shortage will permit. The latest census, taken in November, indicated that Belgium, France, and Italy are still short of coking coal to the figure of 400,000 tons per month.

For a number of reasons the most rapid reconstruction is being made by Belgium. Her success in this regard is attributed by various sources to compact geography and to individual enterprise. The general transport disruption certainly was not as serious in Belgium as in France, but an accura'e evaluation of the enterprise of any nation would be difficult. A favorable dollar balance is also playing a part in her rapid reconstruction.

As with the other nations, first priority has been given by the Belgian government to getting the coal mines in operation. Before the war domestic mines produced 2,500,000 tons per month. After dropping off to virtually nothing in October 1944, the Belgian mines have snapped back to produce an average of over one million tons per month in the first half of 1945, and estimates are that the figure for the last half of the year will average over 1,500,000 tons per month. This increase has been even more laudable since it is estimated that whereas the average output per man per day was 775 kilos before the war, due to a shortage of machinery and skilled men it has now dropped to 545 kilos.

Iron and steel production in Belgium, which before the war was averaging 260,000 tons per month, has increased from a Jan. 1945 low of 1600 tons to almost 50 pct of prewar operations per month at the end of the year.

BELGIUM: Percent of operations compared to prewar levels.

Industry	February 1945	October 1945
Electric power	64 pct	85 pct
Gas	21	74
Water transport	22	57
Rail transport	15	38
Steel	5	34

Pig iron production was under way in no less than 20 furnaces as 1945 drew to a close, with four of this number having been lit during October. This total is from the 54 furnaces in working order late in 1937. Steel has already been exported to Sweden, Holland, Switzerland, Finland and Denmark. Current estimates indica e that about 150,000 metric tons are being made available for export during the period from October 1945, to March 1946.

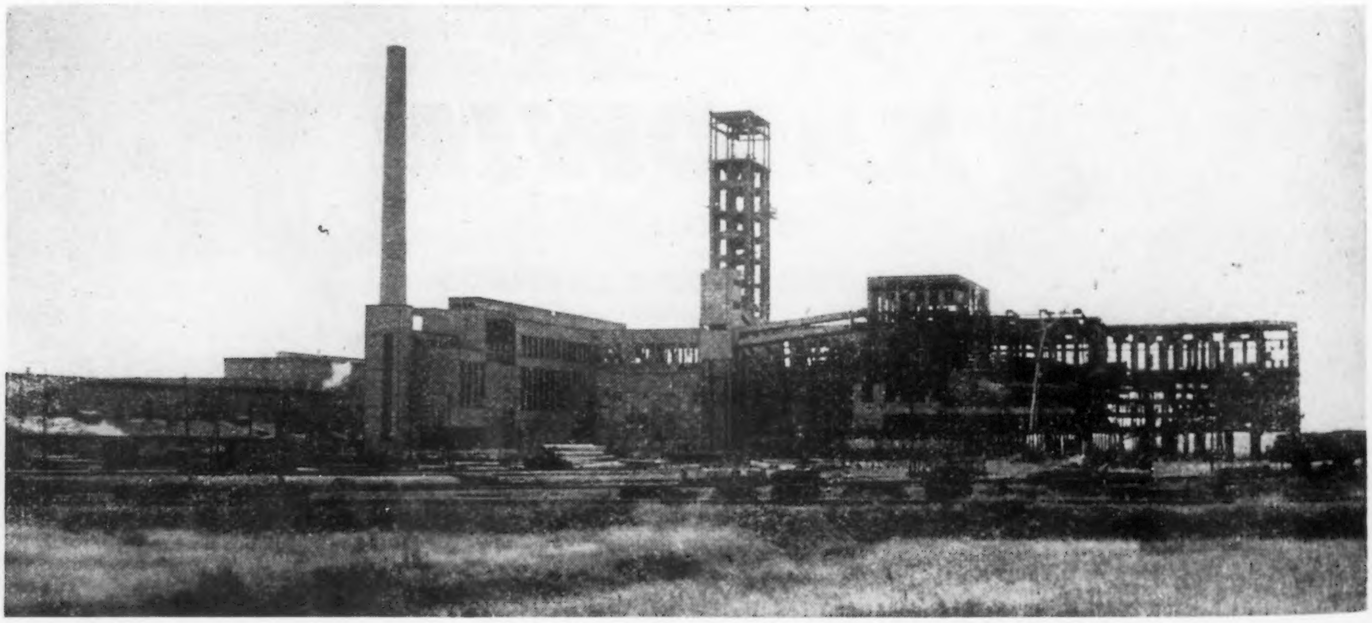
Small quantities of a wide variety of other products are also available for export from Belgium in the same period, including copper and copper alloys, zinc (mostly zinc dust) small quantities of lead tubes, sheets and wire, and some cadmium. Some metal products are also available, including some screw taps, wire drawing dies, chucks, and hand tools. It is estimated that the valuation of these metal products for the period will total about $120,000 at the current rate of exchange.

Belgium's "available for shipment" list also includes dolomite, asphalt, tars, paint and varnish pigments, quarry products, soda, potash, and chlorine.

During the period of the war and in the months after Belgium had been liberated, she built up a favorable balance of lend-lease credit amounting to $120,000,000 which is also making it easier for her to get vital materials needed for reconstruction. Of this

(CONTINUED ON PAGE 290)

THIS bombed Ruhr colliery is again in partial operation. Because of the dependency of western-European economy on Ruhr coal, France continues to insist on internationalization of this area.



Ore and Coal . . . (CONTINUED FROM PAGE 274)

For the nonce, the reserve situation, though something about which both ore producers and consumers are concerned, is not considered alarming. The Mesaba range has met the vast war demands by appreciably shortening its normal life. Thus, the time table is advanced considerably for commercial treatment of its taconites, which almost all in the industry have known must some day supply the furnaces if the Lake Superior district is to maintain its position in the future.

Much diamond drill exploration has been in progress on the Michigan ranges during the year. Also, geological surveys through the state and federal cooperative program have continued in the Menominee district. The last operation of the lower Menominee range, except for two small siliceous pits, was exhausted and closed down late in the summer. The Penn Mine, operated by Pickands, Mather & Co., was the oldest group of mines on this range and had an almost continuous record of production since 1877.

Taxable reserves of the five ranges other than the Mesaba, as reported at the beginning of 1945 as approximately 212 million tons, constituted about 17.5 pct of the total U. S. Lake Superior reserves. However, this is largely underground ore, and accordingly, the measurable tonnage known at any one time is a lower proportion of the probably total recoverable ore than for open-pit mines, where the ore bodies are more readily explored and developed by shallow drilling.

Consequently, the future life of these five ranges is likely to be much longer than the apparent tonnage of present reserves seems to indicate, all of which suggests that statistical data alone can be misleading unless used with knowledge of the origin, significance and purpose of the figures and with good judgment as to their implications.

Of considerable interest to iron-ore producers and consumers has been the further exploration during the summer of the Labrador-Quebec iron ore deposits which have been the objects of field studies and some diamond drilling since 1936. The M. A. Hanna Co. is associated with Hollinger subsidiaries in this enterprise, exploring in a large area about 300 miles north of Seven Islands on the Gulf of St. Lawrence. Numerous deposits of high-grade ore, similar to Lake Superior ore, have been mapped and partly explored by drilling. Unlimited water power is available at Grand Falls and this region may constitute a potential source of iron of great importance to the U. S. and Canada.

Coal

COAL production in 1945, estimated by various experts at 570,000,000 tons plus, or 48,000,000 less than 1944's 620,000,000 ton all-time high, would have been somewhat greater if it had not been for strikes (which cost the country some 17,000,000 according to the Bituminous Coal Institute), particularly the foremen's union fiasco which was called off "until a more appropriate time" after taking the better part of three weeks' loading. But despite interruptions, production stood at 529,420,000 tons on Dec. 1, 1945, as compared with 577,925,000 on the same date a year before.

Early in December, total soft coal production for the 1945 calendar year was estimated at 517,000,000 tons by the Solid Fuels Administration, almost irrefutable testimony that despite absenteeism and assorted hardships at the mines, 1945 coal production was sufficient to take care of all needs. This item, however, is not to be construed to mean that everybody, with special emphasis on the users of metallurgical or specialty coal, got the kind of coal they wanted since coking coal was hard hit, but in general, the country got the coal it needed.

Not surprisingly, there was a shortage of coal that went up the Great Lakes amounting to about seven or eight pct, which came about largely through the diversion of coking or metallurgical coal for extracurricular war projects. As a result, docks may be

TABLE IV
Steel, Pig Iron and Scrap Statistics of the U. S.**
(In Millions of Net Tons)

	Five-Year Average 1936-1940 Inclusive	1941	1942	1943	1944	1945*
Steel Production (Ingots and steel for castings)	52.3	82.8	86.0	88.9	89.6	80.0
Pig Iron Production (Including Ferro-Alloys)	36.2	56.7	60.9	61.5	62.9	53.7
Pig Iron Consumption	34.8	56.2	59.0	60.3	61.0	55.0
Ferrous Scrap Consumption Total	37.6	59.2	60.2	61.7	61.0	57.0
Purchased Scrap	17.5	25.3	27.1	26.6	26.0	26.0
Home Scrap	20.1	33.9	33.1	35.1	35.0	31.0

** Source: American Iron and Steel Institute and U. S. Bureau of Mines.
* Estimated figures.

a bit short this coming year, since on Dec. 1, 1944, about 54,991,880 tons had been shipped through lake ports compared with the 1945 tonnage of 49,924,475, a reduction of 5,067,405 or 9.21 pct.

During the war, the coal industry was called upon for fuel for power in relatively unprecedented quantities particularly because a great deal of heavy industry, particularly in New England, switched from oil to coal; in the South, it went to Army installations, camps and hospitals, and the atomic bomb project; in the three years, eight months and eight days since Pearl Harbor, 2,200,000,000 tons of coal had been produced, an average of 2,000,000 tons daily, except Sundays. The industry managed to perform this monumental task with men from 12 to 15 years older. From this it can be readily seen that the industry has done a real job.

In the early part of the year, the entire coal industry was producing all it could and against two very stringent hardships . . . weather conditions and a shortage of men, caused by the army, and secondly, by a migration of miners to factory work. During these months, some railroads were secretly relieved that they couldn't get available cars to the mines, because of operating conditions, and by the same token, some of the mine people were secretly relieved that the railroads couldn't because the mine operators would not have been able to fill them.

However, the coal situation would have had to be desperate, which it verged upon, to get men back from the army in any numbers. A few were called back, but not many.

These tonnages show that the coal industry has had about eight years production in four years time and development work has fallen by the wayside in favor of "quick tonnage." Extensive mechanizations was another important factor in the big tonnages; mines spent more than $85,000,000 in 1943-44 for underground mining machinery alone.

While operators do not hesitate to say that a good share of the strike situation is attributable to Washington "buck-passing," manpower in the bituminous coal industry dropped from 450,000 men to 375,000 during the war. Despite this depleted labor force, the industry produced more tonnage than the nation has ever before, with 75,000 less men. Another reason underlying these tremendous tonnages is the great increase in strip mine coal, which constitutes about 15 pct of the total. (1942—72,598,382; 1943—85,340,994; 1944—106,763,000.) This increase was due, of course, to an existing demand that exceeded supply, since many consumers consider strip tonnage unsatisfactory in a normal market.

Large strippers are even now working seven days a week, 24 hr a day, producing as high as 50 tons per man per day for underground operations.

It goes without saying that the labor outlook in the bituminous coal industry is somewhat unpredictable with John L. Lewis, leading probably the most volatile union in the country. Unquestionably Mr. Lewis will come up with something substantial in the near future, including a raise, possibly recognition of the celebrated division 50, and even the matter of the 10 pct royalty to take care of hospitalization, etc., may be slated for review. In other words, Mr. Lewis is something of a cloud on the operational horizon.

Operators feel certain that the year will see a fair demand for coal and that this will prevail for the next two or three years, bridging a fairly difficult period of industrial transition.

Exports are running about 2,500,000 tons monthly at the present time, and include some tonnages from western Kentucky, a departure from the usual export coal quality, much of which has come from districts seven and eight in the past.

As some operators see it now, 1946 requirements will be in the neighborhood of 525,000,000 to 550,000,000 tons, and this amount may be required annually for the next two or three years. It is interesting to note that the 11-year average following World War I, starting with 1919 and ending with 1929 was 506,166,160 tons, ranging from a low of 469,000,000 tons to a high of 534,000,000 tons; tonnages of this nature spell prosperity for the bituminous coal industry.

There are, however, some problems before the bituminous industry that harbinger much worse things than even the bogey John L. Lewis can conjure up. First and foremost is the alarming growth of diesel competition, and with four times as many diesels on order as steam locomotives, this is cause for worry. In allied vein, competition of gas and oil, with the big pipelines now opening to commercial channels involving laborless fuel. Thirdly, the various water projects including canalization of the Big Sandy (which operates class as an economic monstrosity).

From the economic point of view, the year ahead has more than a modicum of imponderables, including the degree of industrial activity. A boom will mean a lot of coal, but a depression would mean something entirely different. The real danger of a foremen's strike, loss of which would mean, for the operators, loss of control, and in the immediate future, industry couldn't ride out a long strike simply because coal stocks are too low.

On the bright side, coal still stands supreme as the cheapest source of power, even though the industry has not interested itself a great deal in processing its product; it is still an industry of small operators, about 5000 of them who operate a total of around 7000 mines. However, there are some observers who believe the trend toward consolidations is developing in the bituminous industry, as witnessed by the M. A. Hanna Co.'s ascendance as the largest stockholder in Pittsburgh Consolidation Coal Co., largest bituminous coal producer with completion of plans for merging Bessemer Coal & Coke Co. into Hanna Co. The merger will bring under Hanna's direct ownership, the Bessemer Co.'s stock holdings in the recently formed Pittsburgh Consolidation Coal Co.

With groups putting millions into mechanization, water washing plants and heat-drying plants, which refine coal down to a manufactured product, the day when the little operator could start in business with practically no capital is over.

Nonferrous Metals

(CONTINUED FROM PAGE 90)

While producers are sharpening their pencils over a few cents in raw metal production costs, users stand far more to gain by reducing the greater spread in forming and fabricating costs.

A Chicago magnesium foundry exemplifies the possibilities in price reduction of end products thus: "Some 18 months ago our average price of magnesium-alloy castings was $2.50 per lb. Our price the first of August was $1.70 per lb—and selling prices are still on the down grade. In fact, today we have some magnesium-alloy castings selling as low as 55¢ per lb."

Future experimentation in forming and fabrication must be depended on to reduce costs sufficiently to embrace the fields of use justified by magnesium's physical properties. One step in this direction may be the proposed assignment of a 30,000-ton hydraulic press built for the government but not in use at the war's end, to experimental work for potential magnesium users. Marked improvement in mechanical properties, corrosion resistance, machining, welding and forming practice, and avoidance of fire risk have resulted from vast wartime research and use. Correlating these findings and lowering cost is the task necessary for the industry to bring to commercial fruition vast use possibilities.

Base Metals Sail On

The rocks of reconversion foundered magnesium. Aluminum lost its best customers overboard when the war ended. But the old fashioned base metals—copper, lead, and zinc—continued to drift along, relatively oblivious productionwise that the consumption stream has completely changed its course.

For these three the rapids will be reached next June 30, when the government's premium price plan is due to end. The premium price plan has assured mine operators, within certain limits, that Uncle Sam will pay them a profit to mine marginal ores. Thus, for the first 6 months of 1945, the average price paid for copper mined in the United States was 13.7¢ per lb, compared to a ceiling market price of 12¢; for lead 8.7¢ compared to a ceiling market price of 6.50¢; and for zinc, 11.2¢ compared to a ceiling market price of 8.25¢.

There seems to be little doubt among officials of the federal agencies concerned with metal production that when the premium price plan dies, the metal price ceilings will be knocked off simultaneously. Prices will be free to seek their own levels. Guessing what these levels may be is a grand game, with pertinent factors kibitzing from all sides. What will be: Domestic consumption? Foreign requirements? Foreign production? Tariffs? Sterling bloc regulations? Comparative production costs?

As a starting point note that the premium price plan has boosted the average price paid copper producers only 2.1¢ over the 1937-39 average market price; lead has been boosted 3.44¢; and zinc 5.78¢. Given the same supply and demand relationships as prewar, free postwar prices might be expected to adjust themselves downward by these same amounts. But supply and demand, difficult as they are to gage, will not be the same.

United States mines in 1945 produced only about 760,000 net tons of copper, slightly less than half the amount consumed in this country during each of the war years, and barely enough to fill demand in most years of the late thirties. With expanded reconversion activities, the prediction that the U. S. will be producing less than its needs within another 10 years seems conservative.

The entire face of world copper production has changed during the war. Production capacity of both Chile and Rhodesia has increased tremendously at the insistence of the U. S. Canadian capacity, more than half of it a by-product of the Sudbury, Ont., nickel mines, has stepped up. The Belgian Congo is in a position to take over the European market almost single handed. The British Empire, whose resources formerly balanced its requirements, now finds itself oversupplied with Rhodesian production plus a probable 150,000 tons a year from Canada. Chile, which has been selling to the U. S. government at 10.25¢ per lb f.a.s. Chilean ports, finds itself facing a 4¢ U. S. duty, and a probable surplus of 300,000 tons a year for which it must find a market.

It is difficult to find a firm footing anywhere in estimating world demand. Yet this is obviously the key to what the free world price will be. And this price will not only cast a heavy shadow over the American price but over foreign policy in South America. For the time-being, however, the 4¢ tariff should raise the domestic price to the premium price level of 13.7¢ or better.

Zinc May Dip

Zinc, however, may seek its prewar price habitats in a free world market, dipping below the frozen U. S. price of 8.25c, particularly if the lead price rises. The current frozen price on the London market, it may be pointed out, is less than 7c. Mexico, this country's largest foreign supplier, loses the shelter of a special tariff agreement 6 months after the "duration." Domestic mine production of zinc in 1945 was about 600,000 net tons, compared to consumption of about 810,000 net tons of metal produced by the primary refiners. Loss of as much as 75 pct of the Tri-State district production, which constitutes about one third of U. S. supply will be a severe blow, and it is quite possible that the country may be only too happy to call on other parts of the world to supply a portion of its zinc needs.

During the war, the U. S. balanced its lead budget by cutting civilian consumption to the bone and importing every pound it could lay its hands on. With restrictions off, pentup civilian demand should augment rather than lessen requirements. Dwindling domestic lead resources indicate an ever-increasing dependence upon imports, principally from neighboring Canada and Mexico. In this respect, the U. S. tariff, more an anachronism than a protection, may come in for examination. As with zinc, 6 months following the official end to the war, the present 1 1/16¢ tariff, which the government has been paying on its purchases, is slated to bounce back to 1.7¢.

With domestic lead mines operating at about only two thirds of their potential because of manpower shortages, approximately 380,000 tons of lead were mined in the United States in 1945. Imports from Mexico, Canada, Peru, and occasionally Australia, ran about 20,000 to 25,000 tons a month until the end of the war and since have dropped to about 15,000 tons per month. With domestic mines only

able to support about 35 pct of reconversion consumption, and the deficit not entirely made up by imports, the government has had to dig into its stockpile. At the end of 1945 it is estimated that the government stockpile contained less than 70,000 tons. Further stockpile withdrawals are probable this year. As John D. Small, chief of the civilian production administration, has pointed out, chances are slight that imports could be made at the present 6.5¢ ceiling in a free market, and government purchases, absorbing any difference between the domestic and world price and waiving duty, would be necessary if the ceiling were indefinitely continued. European demand is believed to be sufficiently heavy to bring offers above the 6.5¢ U. S. ceiling. The Silesian and Yugoslavian lead mines which normally supply western Europe now are sending their entire output to Russia. Little can be expected from Burma, whose railroads were destroyed by the Japanese. It all adds up to an eventual higher price of lead for consumers.

Ferroalloys in Mothballs

Domestic mines, which made a valiant effort to step up production of the ferroalloy minerals during the war to save shipping space, with a few exceptions slumped back into their old ways in 1945.

Of the welter of mines and gopher holes scratching for manganese in the early part of the war, only Anaconda Copper Co. and Domestic Manganese Co. at Butte, Mont., and Dominion Manganese Corp. in Virginia were producing a substantial tonnage at the end of this year. Even the Sunshine Mine on the Olympic Peninsula in Washington, which became a substantial wartime producer, went down. Together the domestic mines produced slightly less than 193,000 tons of ore, 35 pct or more Mn, during 1945, compared to 247,616 tons listed in 1944 by the U. S. Bureau of Mines. With shipping lanes opening up fast in the latter part of the year, imports of ore of the same grade reached about 1,500,000 tons compared to 1,157,561 tons in 1944 and 1,429,599 tons in 1943. Gold Coast, Cuba and Brazil were principal suppliers with lesser amounts from Chile, India, Union of South Africa, Russia, and Mexico.

Both domestic production and imports of tungsten followed consumption down hill as wartime demand for armor-piercing shot and tool steel declined. Against a 1944 domestic production of 10,259 short tons, in terms of 60 pct WO_3 concentrate, 1945 output dropped to about 5900 tons, less than any year since the defense program started. About three quarters of the production came from the Yellow Pine Mine of the Bradley Mining Co. in Idaho, the most important discovery of the war period, the Nevada Massachusetts Co. in Nevada, and the Salt Lake City plant of the Office of Metals Reserve, which treated ores from a number of producers. The Pine Creek Mine of the United States Vanadium Corp. in the high Sierras near Bishop, Calif., was closed for most of the year, although secondary concentrates were treated at its chemical plant.

Imports were approximately 8500 tons of concentrates, about half of which came from Bolivia and a third from Brazil. Lesser amounts were imported from Argentina, and Peru, with very little from China, the big prewar supplier. Bolivian producers made efforts to step up their production, as the buying price of the United States government progressively declined in a prearranged program.

Domestic vanadium production continued on a par with 1944, when ore and concentrates containing 3,527,054 contained lb of vanadium were produced. On the basis of data for the first nine months, imports appeared headed for a figure of approximately 1,700,000 lb of contained vanadium, compared to 1,284,603 lb in 1944 and 2,052,620 lb the previous year.

The vanadium industry of western Colorado, western Utah and northeastern Arizona, shared in the reflected glory because of the presence of uranium in the carnotite deposits of those areas. From 2 to 4 pct U_3O_8 is carried in these ores, and United States Vanadium Corp. actively recovered the uranium content at its Colorado plants. Vanadium Corp. of America also was active in this district.

The U. S. continued to demonstrate its self sufficiency in molybdenum production, although production declined from the 1944 level of 38,679,500 lb of contained molybdenum in concentrates to about 36,500,000 in 1945. Climax Molybdenum Corp. continued to be the dominant producer from its Colorado property.

Canadian nickel production, virtually all of it from the Sudbury District, Ontario, mines of International Nickel Co. of Canada, Ltd., continued to comprise the greater part of world output. Nickel production from the company's own mine, plus a smaller amount refined from other mines, was estimated to be about 247,000,000 lb in 1945 although exact amounts were not disclosed. Minor amounts were produced in New Caledonia, whose production appeared to be tapering off, and from Cuban operation of Nicaro Nickel Co., Freeport Sulphur Co. subsidiary, financed by the United States government. The Nicaro refinery is located at Wilmington, Del., and its production largely is in the form of nickel oxide used for direct alloying by the steel industry. Because of the copper content and valuable platinum group by-products of the Canadian ore, this source is expected to continue overwhelmingly dominant.

Postwar Stockpiles Delayed

As the year drew to a close, Congress had not yet passed any stockpiling legislation, although the best mining men and economists of the country were hot on its trail to do so. Dr. Allan Michael Bateman summed up the argument in stating that had the U. S. had stores of strategic minerals at the outset it would have (1) made World War II less costly and would have shortened the period of preparation, (2) would have saved our limited shipping for military purposes, and would have reduced the waste in cargo ships lost in enemy action, (3) would have saved manpower which had to be allocated to the production of equipment and supplies needed to bring metal stocks up to wartime requirements, and (4) would have eliminated the hazards of keeping supply lines open under wartime conditions.

Elmer W. Pehrson, chief of the economics and statistics branch of the Bureau of Mines, estimated that it would require not less than 10 yr and cost $4 million to build a stockpile of metals and minerals to the size recommended as maximum requirement by the Army-Navy Munitions Board. Mr. Pehrson underlined the need for stockpiling by estimates of domestic commercial reserves of 33 minerals compared with the 1935-39 annual rate of use. Nine of them, magnesium, nitrogen, bituminous coal and lignite, salt, phosphate rock, molyb-

denum, anthracite, potash, and iron ore, are said to be available in quantities equivalent to more than a 100-yr supply at this rate. Four—sulphur, natural gas, fluorspar, and copper—fall within the 25 to 100-yr supply bracket; eight—zinc, petroleum, cadmium, gold, lead, silver, bauxite, and vanadium—are in the 5 to 25-yr group; and reserves of the remaining 12—antimony, tungsten, platinum, mercury, asbestos, manganese, chromite, nickel, tin, industrial diamonds, quartz crystals, and flake graphite—represent less than a 5-yr supply.

"The significant point is that if a division is made at the 35-yr level, a period but little more than the usual interval between wars, 21 of the 33 minerals fall below the line, and this group includes petroleum, copper, lead, and zinc, in the production of which we have led the world for many years," Mr. Pehrson said.

Getting down to political factors, the crux of the stockpile question probably will be whether to pay subsidies to mine out remaining domestic reserves for the stockpile or whether to depend largely upon imports.

Mr. Pehrson argues that "because stockpiling is a device for supplementing our domestic resources, the stockpiles should be made up largely from foreign materials, for that is the only way we can add to our basic mineral resources."

With foreign sources as a basic requirement, he also suggests that "a large stockpiling program could provide a reservoir in which domestic materials might be placed in times of depression with resultant economy to the nation and benefits to the mining community. With such a two-pronged program, there can be little argument. As a foundation are stockpile reserves built up during World War II. (See table I).

The Bureau of Mines program also sees the need, as a second line of defense providing against mistakes in stockpile planning, a vigorous program of exploration for marginal and submarginal resources.

Labor

(CONTINUED FROM PAGE 85)

scene in 1945 was the huge output of our mills, mines, factories and farms. However, this record is well known, at least in the aggregate, and any attempt to present it in detail would go far beyond the limits of this article.

But it does seem pertinent to ask what the war years tell us about productivity—output per manhour. We know that in all manufacturing industries combined the figure more than doubled between 1919 and 1937, increasing about 3 to 3½ pct annually. Over the same 20-yr period manhour output jumped 169 pct in agricultural implements, 168 pct in blast furnaces, steel works and rolling mills, 164 pct in nonferrous metals and 178 pct in motor vehicles.

During the war period, it has not been possible to compile statistics on output per manhour for most of the durable goods industries. Most types of consumer durables were not produced during the war. In other cases, the necessary statistics were not available for the war period. In general, in the nonmunitions manufacturing industries for which data are available (mainly industries producing consumers' nondurables) there was little change in productivity between 1941 and 1944. War production requirements precluded any extensive installation of new equipment or the development of new production techniques in these industries. Moreover, operations were handicapped by the loss of experienced workers to the armed forces and to war industries, restrictions of production, material shortages, the use of substitute materials and similar difficulties. Recruitment of untrained workers, longer work weeks, and increased use of second and third shifts may also have tended to reduce output per manhour. Many of these same influences doubtless operated in the durable goods industries during the war.

On the other hand, the war production program

Table IV

Situations Disposed of by the United States Conciliation Service Classified by Manufacturing Industries Jan. 1, 1945 through VJ-Day

INDUSTRIES	Strikes		Threatened Strikes		Controversies		SUB-TOTAL		Arbitration		Technical Cases		Other Situation		GRAND TOTAL	
	No. of Cases	No. Involved	No. of Cases	No. Involved	No. of Cases	No. Involved	No. of Cases	No. Involved	No. of Cases	No. Involved	No. of Cases	No. Involved	No. of Cases	No. Involved	No. of Cases	No. Involved
Iron and Steel	315	156,028	129	44,305	1,105	336,826	1,549	537,159	96	10,663	20	858	68	2,997	1,733	551,677
Nonferrous metals	66	29,951	32	20,534	375	162,621	473	213,106	31	721	4	128	37	604	545	214,559
Machinery	83	32,187	47	27,669	609	223,027	739	282,883	56	5,648	12	2,599	32	504	839	291,634
Electrical Machinery	34	25,358	41	34,845	290	436,293	365	496,496	34	1,291	3	1,407	33	399	435	499,593
Transportation Equipment[1]	235	491,156	88	250,423	939	2,387,560	1,262	3,129,139	82	32,439	10	4,194	98	2,196	1,452	3,167,968
Automobiles	11	9,936	6	1,904	65	22,342	82	34,182	13	487	6	1,331	6	12	107	36,012
Subtotal	744	744,616	343	379,680	3,383	3,568,669	4,470	4,692,965	312	51,249	55	10,517	274	6,712	5,111	4,761,443
All Others	1,142	355,056	1,072	1,404,330	6,661	2,149,082	8,875	3,908,468	445	96,184	59	10,307	677	38,574	10,056	4,053,533
GRAND TOTAL	1,886	1,099,672	1,415	1,784,010	10,044	5,717,751	13,345	8,601,433	757	147,433	114	20,824	951	45,286	15,167	8,814,976

[1] Not including automobiles.

made especially heavy demands on the metalworking industries, and there were more improvements in production methods in these industries. Important technical advances were made in welding methods, heat treatment, and inspection methods, to cite but a few examples.

We can anticipate extremely rapid increases in productivity for several years as wartime difficulties are eliminated and new equipment is installed to meet accumulated replacement needs. In all manufacturing industries combined, output per manhour may increase by as much as one third within three or four years. The durable goods industries should achieve comparable productivity gains, especially if the markets for both consumers durables and producers durables meet current expectations. In addition, the durable goods industries, more than any other group, will be in a position to utilize wartime technological advances.

This question of productivity is almost inseparable from the equally complex problem called industrial relations. I prefaced this article with an outline of some major factors that underlie most labor disputes today. With these factors in mind, I would like to discuss first the work of the U. S. Conciliation Service.

Since it was set up in the Department of Labor in 1913, the Conciliation Service has disposed of more than 100,000 cases, using voluntary methods of conciliation and mediation. In the vast majority of cases settlements were reached around the conference table, with a Commissioner of Conciliation sitting in as a friendly, impartial peace-maker.

From Jan. 1, 1945, through VJ-Day, the Service handled 15,167 cases, involving nearly nine million workers. As table IV shows, these situations ranged from relatively minor differences to strikes and lockouts. Significantly, of those cases that reached the Conciliation Service *before* a walkout occurred, 95 pct were settled with no break in production. This is an impressive record, especially when we remember that the process is entirely voluntary—commissioners do not issue mandates or directives. Indeed, the Conciliation Service does not even enter a case except at the request of the parties involved, or, occasionally, at the request of a public representative.

From VJ-Day through Nov. 24 the Conciliation Service handled 4811 cases. In 2821 of these controversies, commissioners were able to bring about agreement between the parties during the negotiations. In 924 other cases the dispute had sharpened to the point where a strike had been authorized, nevertheless a work stoppage was averted. In 1066 cases the conciliators were only on hand after a strike began, yet in 868 of these cases they were able to bring about a settlement.

There were 198 strikes going on in which the efforts of conciliators had not been successful. Many of these turned upon matters that are outside the sphere of conciliation, such as prior approval of price increases.

All in all, I think this record deserves much more praise than it has received.

In all of its data on work stoppages the Bureau of Labor Statistics merely attempts to provide a limited measurement of the actual number of work stoppages current at any one time, the number of workers involved, and an estimate of the total manhours of idleness resulting directly from the stoppage. This total includes not only the workers directly involved in the stoppage, but any and all groups of workers in the plant or establishment who are made idle by the stoppage.

The Department of Labor is fully aware of the fact that these figures do not cover all the social and economic impacts of a work stoppage, but we doubt whether any statistical or other means could be developed which would measure all the impacts of a strike. To give but a single example:

We recently had a strike of bus and street car operators in Washington. It was comparatively easy to determine the actual number of wage earners involved and the time they lost. But many government employees and other workers in this city also had difficulty in getting to work—some were late, others were absent. Assuming that we could determine the number of absentees, this total probably would include many employees who took a day off for reasons other than the lack of normal transportation. However, even if it were possible to measure precisely the number of workers kept from work by the stoppage, it still would be beyond the ability of any organization to measure the effects on sales in downtown stores and other mercantile establishments.

Industrial strife always is costly, and the problems it raises often are difficult and obscure. Yet, I believe that labor and management can compose their differences. The means is already at hand—collective bargaining—and it is being practiced every day in thousands of plants and businesses throughout the country. Only the failures are headline news. In saying that I do not mean to gloss over the very real problems that make genuine collective bargaining difficult. But I do say that the area of agreement is steadily broadening.

The best proof of this fact is the growing acceptance of collective bargaining. In April 1935, the Bureau of Labor Statistics estimated that dealings with employees through trade unions were carried on by 19.5 pct of the business and industrial establishments covered by the survey, employing 26.0 pct of the employees.

As 1941 drew to a close, about 30 pct of all eligible employees were employed under the terms of union agreements. In manufacturing, mining, building construction and transportation nearly 55 pct of all workers were under union agreements, but less than 10 pct of those in wholesale and retail trade, personal service, clerical, technical and professional occupations were covered.

At the end of 1942, some 13 million wage and salaried workers were covered by collective bargaining agreements. This was more than 40 pct of all persons employed in occupations where unions were trying to obtain written agreements.

By January 1945, about 14 1/3 million workers, representing 47 pct of the "eligible" employees, were under union agreements. In manufacturing industries approximately 2 out of 3 production workers were covered and one-third of the "white collar" group.

While it is true that this wider acceptance of unions has not precluded industrial strife, it has largely removed one of the main causes—namely, management's past refusal to recognize or bargain with outside unions. The prolonged strikes against the "Little Steel" companies in 1937 failed in most cases to gain

immediate recognition, but by the end of 1941 these companies were negotiating master agreements covering most of their employees.

For those skeptics who charge that collective bargaining is outmoded and unequal to the task, I want to paraphrase a well-known saying, "To cure the evils of collective bargaining, we need more collective bargaining." Let me enlarge on that statement. It implies a continuing, developing relationship between labor and management. Real bargaining cannot be imposed by fiat—it comes with practice and a genuine determination to make it work.

In many cases necessary wartime controls imposed by government interrupted the first beginnings of collective bargaining—examples of this are numerous in the metalworking industries. Add to this lack of experience the stress and uncertainty that reconversion has brought, and it is not surprising that disputes have multiplied along the industrial front.

In concluding this review of the labor scene in 1945, let me underline once more the compelling need for more tolerance and better understanding between the two great groups that turn out the nation's manufactured goods. If this appeal lacks the dramatic touch of a compulsory cure-all, it also avoids the dangers inherent in compulsion.

Consuming Industries

(CONTINUED FROM PAGE 119)

is the development of lighter weight containers, possibly of the returnable type. Study is being given the container problems encountered in air freight and air express. Light gage stainless steel, aluminum, and other metals and materials are being investigated; standard specifications for containers are being examined and recommendations for revisions will soon be made.

The second development that will reach a stage of new importance for peacetime shippers in 1946 is that of protective coating and liners for shipping drums. The use of synthetic resins as liners is opening a new field for this mode of packaging. One of the first users of lined containers was the shortening industry. As resins improved, other industries adopted the lined cans for various products, and much of the rapid growth in the use of the steel container is the result of this development. During the war tremendous strides were made towards improving known coatings and developing new ones. This will continue and the future use of lined drums is governed only by the production of better coatings and the ability of the industry to efficiently use and adapt them to customer requirements.

Before the war, only 28 pct of the drum users regularly used lined containers and these shippers used them only to a limited extent. A recent survey conducted by A. N. Diecks, Baltimore, showed that of 250 drum users, 80 pct will require from a minimum of 15 pct to more than 90 pct of their total requirements in lined units. This survey covered such fields as chemical, petroleum, solvent, lacquer, food, and cola producers and processors. The standard containers fabricated from special steels, nonferrous metals, tinplate, and other materials will continue to be used as heretofore, but some observers feel that it is questionable, with advancements already made in the synthetic resin field and with those to come, that the volume of this business will increase to any great extent.

The steel drum industry, like the can makers, will need considerably more steel in 1946 than it will be able to obtain. Sheet and strip, and an end product, tinplate, are the tightest items in the steel industry. Deliveries are extended for months ahead, and the demand for these products is continually increasing. Observers in the steel industry believe that present demands for sheet and strip, along with normal re-demand, are sufficient to keep sheet operations at peak for at least three years. Thus, tinplate and sheet deliveries in 1946, while they will be heavy, cannot possibly satisfy the demand of the container industry.

Consumption of steel by the container industry in 1946, including can manufacture, drum production, and other phases such as gas cylinders and steel strapping, according to estimates by THE IRON AGE, will total some 4,000,000 net tons, as shown in table V. The Iron and Steel Plants Disposal report indicated that the container industry will require 3,900,000 net tons, 3,500,000 tons, and 5,000,000 tons, according to the specific authorities that made recommendations for the report. J. A. Krug set steel consumption by the industry at 4,133,000 tons. Based on the performance of the industry for a number of years prior to the war, these estimates break down product-wise as shown in the table. Some variation from this breakdown is likely simply because of the expansion program of the industry; the efforts of the canning industry to expand its markets; and the abnormal peacetime demand that is expected for shipping containers.

Housing

NATURAL corollary to the housing crisis is the estimates of housing requirements for the first postwar decade undertaken by various agencies and organizations. This need has been set at anywhere from 7½ to 20 millions. But the 12.6 million new dwelling units established by the National Housing Agency has passed the test of reliability and most groups, private and public, have accepted it as their springboard.

Whittling down this figure is no easy task. Little in the way of new construction could be accomplished during these first few months of postwar life. Material shortages which had been expected to ease with the end of the war became even more stringent. OPA controls, labor shortages and strikes, particularly that in the West Coast lumber mills and, of course, the uncertainty of government action hindered the flow of supplies to builders. And, as is well known, the building trades do not flower until spring.

Some of the 60,000 or more new homes started since

VJ-Day, although structurally complete, could not be sold because of the lack of bathtubs, sinks and other cast iron items. Foundries, many casualties of the war, had their share of reconversion headaches.

Steel shortages also added to the problems of the builder. Rough estimates of the amount of steel contained in a house run from ½ ton to 2 tons including heating equipment. Much of this is in the form of sheets and shapes. Extended deliveries on these products are too well known to require discussion here. It is sufficient to say that houses, otherwise ready for occupancy, have been waiting for refrigerators, stoves, cabinets and boilers.

During this year, 500,000 privately financed dwelling units are expected to be built. In 1947 new construction will increase to 750,000 and will reach one million in 1948, according to home builders' estimates. Desire for *lebensraum* which had been forced to hibernate during the war years is sufficiently great to support this one million new homes a year for eight to ten years. Thus in 10 years private industry can supply the needs of 9,250,000 families.

While the greatest bulk of this new construction, more than two-thirds, will be in the $7,500 and over class, public pressure has been for new homes selling at $4000 to $6000 and below. Builders' objections to erecting new homes in this price range on the grounds of rising costs of material and labor have been countered with the cry of stagnation. This has been a relatively simple attack to loose since home building is a grass roots industry that obviously does not have the physical plant to undertake any large housing research investigations for the purposes of reducing housing costs.

Studies conducted by universities, building materials manufacturers, private foundations and trade associations, however, have led to some improved technology. There is now an increased use of off-site fabrication for floors, stairs, windows, cabinets and the like. New materials have been introduced and wider applications of more efficient materials will undoubtedly come in the future.

Prefabrication which was an almost inconsequential factor prior to 1940 found the war a great stimulant to activity. Current capacity is about 165 000 houses a year and if planned expansion takes place, prefabricators will be able to produce 200 000 units annually. At present these factories are working at only one-tenth capacity.

However, prefabricators anticipate a fruitful field once the public gets over its impression that prefabrication means temporary housing. Evidence of this optimism are the plans of Gunnison Homes, Inc., a U. S. Steel Corp. subsidiary, to build a million dollar plant at New Albany, Ind. Output will reach 1650 houses a year on a one shift basis.

Prefabrication is not the revolutionary building technique popularly believed. It is merely an extension of the trend in building toward greater off-site fabrication to permit greater mass production. Advantages inherent to any factory system of fabrication are found here. Materials can be used more efficiently, seasonal work is eliminated and material costs are reduced by direct mill purchasing. Added attraction to builders should be the quick return of investment since in only 10 days prefabricated homes are ready for occupancy.

It falls short in solving the real low cost housing problem without government aid since such homes will probably sell for some $4000 to $6000. As greater numbers of homes come off the prefabricators' lines, there may be a drop in price if past history of mass production can be applied.

While war displacements have made the housing shortage a general problem, its existence has been well known to those in lower income brackets. Any long term solution of this general need for reduced housing costs will come only when a radically different house can be designed. Wider application of steel may well offer the answer.

While steel will not be used in prefabricated houses for some time yet, future consumption of steel in the field of residential construction will no doubt increase greatly. The only drawback thus far has been the lack of public acceptance. But once this is overcome, developments like steel panel sections, steel floor units, steel window sections and frames, roofs, pressed steel bathtubs will receive wider application. Increased use of porcelain enameled steel can be expected in kitchens and bathrooms.

An apartment building in River Forest, Ill., has made use of steel for interior wall partitions, for window sections and frames with porcelain enameled steel sills. Floors were made of steel sheets covered with wood or linoleum. Vertical steel panels attached to the floor provided the required strength to support the succeeding floors or roof.

The steel house would lower maintenance costs since walls would remain cleaner and provide a better surface for paint. With proper insulation, which is easily provided, heat conductivity and condensation are decreased. Even more important, steel panels replace the need for several wall layers like stud, lath and plaster.

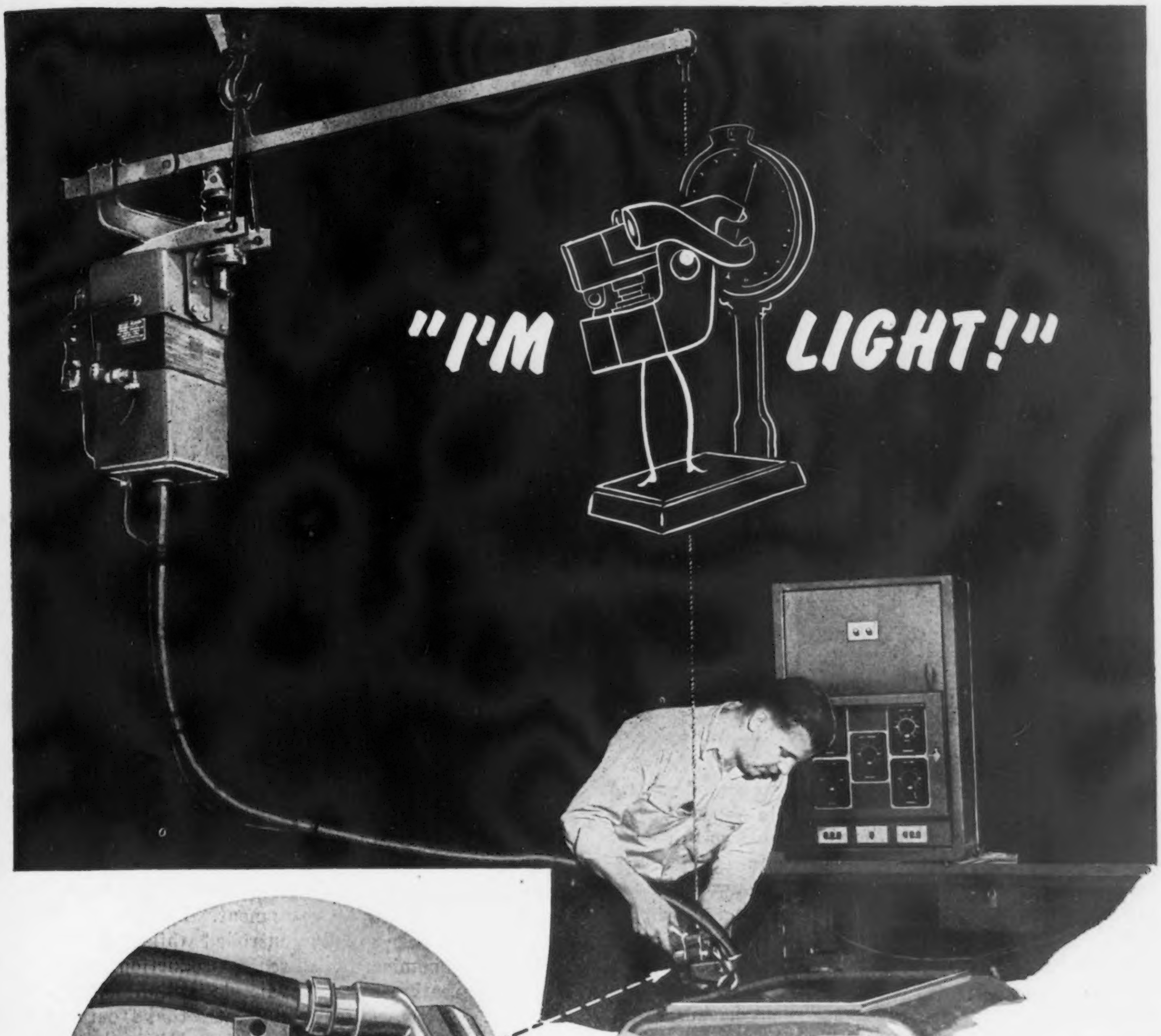
Material cost reductions are difficult to achieve because of the many restrictive practices to which the building industry is subject. Labor, contractors, subcontractors, building material manufacturers and suppliers and local building codes impose many outworn restrictions on the building trades. Building codes must certainly be revised. It is generally agreed that instead of calling for specific building materials performance standards should be specified. Before any fundamental change in techniques leading to substantial cost reductions can be accomplished, these impediments to progressive action must be removed.

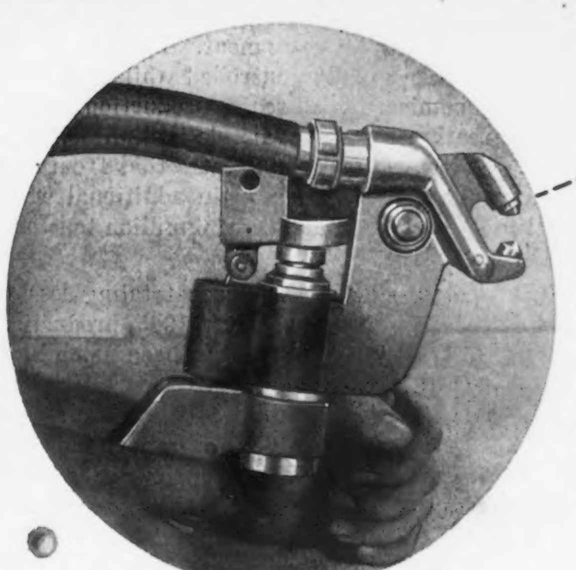
TABLE VI

Breakdown of Steel and Cast Iron Used in Average House Based on Single Family Detached House

	Steel In Lb.	Cast Iron In Lb.
Structure	1,295	322
Plumbing	271	1,183
Heating	255	377
Electrical	81	0
Total	1,902	1,882

(The above figures do not include utilities and connections.)


"I'M LIGHT!"



amount, about $45,000,000 is being used to pay for lend-lease material which was on order when the war ended, and a nearly similar sum will be spent on the purchase of surplus U. S. Army goods which are declared on the Continent. Most of this will be made up of trucks, rolling stock, food, and what clothing is available.

In addition to the serious financial, economic and social problems left by the German occupation, France is passing through a difficult period of governmental upheaval, even more serious than that of Great Britain. The trend toward increased government control of business was well under way in France before the war, and is being more extensively developed under the provisional group now in power.

Part of the program of each of the three major parties represented in today's coalition Assembly is a program of nationalization of industry, and in the seven months of life allotted to this group extensive plans are to be propounded. Opinion in France varies as widely as possible on how extensive that public ownership program should be extended. The only basic principle that seems probable of general adherence at the present time is that nationalization is desirable for the basic raw material industries, but unnecessary for finished product organizations. As to any precise definition of what are the raw material industries there is still no definite agreement.

Already accomplished is the assumption of control of the largest coal producing areas, in the Nord and Pas de Calais regions, which produce two-thirds of France's coal. The record of these mines under government control seems admirable, but any final decision must be reserved for the future. Production at the end of 1945 was at a rate equal to 98 pct of the 1938 average. Despite this high rate, it must be recalled that as regards France's total coal needs, she is an importing country. In the average prewar year she imported about 70 pct of her coke.

In addition to the nationalization of the coal mines, a program has already been drawn up for the assumption of control of the five or six principal banks, and the insurance firms, and electrical utilities are also to be included. Beyond this sphere, the definition of government control in France is less certain. At present, however, government tells business what to manufacture, how much of it, where to get the materials, and how much to charge. Regardless of whether actual shares are taken over by the government, it is agreed among most French businessmen that the controls outlined above are destined to remain in force. The decision on more drastic steps probably depends on just how well industries work out their own problems.

If awareness of the problems that it faces is any criteria, the iron and steel industry of France has a reasonable chance of reaching a solution to its own problems. During the prewar years, France was exporting iron ore and ferroalloys, and importing coal and coke. Industrialists in France are as interested in the ultimate destiny of Germany as are those of Belgium and Great Britain. If Germany is to be an importer of large quantities of semifinished or finished steel products, France is anxious for her steel industry to be prepared to usurp its share of this market, as well as its share of what before the war were Germany's export markets.

The industry is aware that in order to accomplish this expansion, much modernization will have to take place in both blast furnace plants and steel mills. Before the war there were 205 blast furnaces, of which 107 were in operation in 1938. Of these, only between 20 and 30 were in operation at the end of 1945, due mainly to a world-wide coal shortage. Generally speaking, the blast furnaces and steelmaking furnaces are rather less obsolescent than most industrial equipment in France, due in large part to the damage suffered in the first World War. It is in the rolling mill departments that the country's greatest modernization work must be done.

Two Large French Mills Planned

Two great new mills are planned, and it is probable that orders for at least one of them have already been placed in the United States. One of these plants is to be located in the eastern industrial region of France, and the other in the north. Plans are also being drawn up to replace many of France's 30-ton steelmaking furnaces with units of 75 tons or over, considered more suitable for her needs.

The modernization outlined above may be partially hamstrung because of the extremely embarrassing financial position that the industry is in, and particularly for a shortage of foreign exchange with which to buy American rolling mill equipment. Capital available to the firms today is inadequate for the working needs of even a moderate sized industry, barring large investments in capital equipment. Because the price of steel has been rigidly controlled while costs due to very uneconomical small-scale production have increased greatly, the sum available is diminishing constantly. One official estimate states that from 9 to 12 billion francs would be needed in additional working capital to support an industry of 6 million tons annual capacity in France.

While steel production has been totaling less than 20 pct of the 1938 average during 1945, production in many firms actually using steel has been much higher. Many mechanical engineering firms report activity for the year averaging as high as 75 pct of their prewar capacity. This anomaly is due to a nationwide year of what Washington would call "depipelining." In other words, in France, as in Germany, the general industrial production figure seems destined to get worse before it improves measurably. A sudden influx of coal imports to France seems to be the only situation that could forestall this drop in industrial activity. The power shortage, which in the first days after liberation was crucial, and the transport situation have now improved sufficiently to make coal the controlling factor, either directly or indirectly in almost every field of endeavor.

In the steel-consuming industries generally, Frenchmen take the attitude that if raw materials and power are available, they will be able to equal their 1938 production in 1946. They are almost certain, however, that the forementioned conditions will not be met.

Despite her tremendous war effort, and the damage wrought by Germany's vengeance weapons, Britain has a less trying period of reconstruction facing her industrial establishment. The final ascendancy of the Labor Party to power during 1945, however, made almost unanimous the swing to the left that is changing the character of European industry. The effort to bring about a system of nationalization for most of British industry as quickly as practicable is overlapping the reconversion effort to some extent, and making it more complex.

At the same time that industrial leaders are planning their re-equipment programs for plants that have grown obsolescent during the war, they must hedge their programs adequately to prepare for the possibility that the planned economy being drawn up may call for public ownership of their industries. The definitions of the scope of the nationalization were only beginning to become clear as 1945 drew to a close.

The news of future policies is being released gradually in the course of Parliamentary debate, and indicates that price and production controls are certain to remain on the production of raw materials, although it is contemplated at some time in the future to remove the controls from labor.

The steel industry is completing its detailed plans for the modernization of the industry, and is carefully adhering to government desires in regard to the proper location of new facilities. It is hoped that through an aggressive program of rationalization planned in the British Iron and Steel Federation, including the cleaning out of old equipment and replacing with new, as well as a 20 pct increase in the overall capacity of the industry, it will be possible to avoid increases in the measure of control which the industry now feels through the Federation.

The total cost of the program for the next five years has already been announced as $480,000,000, and will cover the construction of 2,500,000 tons of coke capacity, 19 new blast furnaces, $80,000,000 for new melting shops, and $132,000,000 for new rolling mills and replacements. Some of this work is already under way.

In contrast to this feverish activity on the part of the steel industry to ward off possible government action, some businesses in Britain are drawing up cautiously, and refusing to undertake contemplated reconstruction work until the government makes some definite commitment in regard to what industries are to be affected.

There is already some evident reluctance on the part of the government to take over an industry bodily if any satisfactory means of control exists. It seems likely that through the British Iron and Steel Federation or some modification of that organization it will be possible for the government to plan the steel economy without going through the laborious task of actually buying all of the shares of the industry.

Export

(Continued from page 169)

lars to use for purchases from the U. S. which makes it necessary to refuse licenses for imports from the U. S. in general for products that are available in the Sterling Area.

Foreign traders in the U. S. assume that the negotiations in Washington with the British on the postwar reconstruction loan will result in the doing away with the sterling-block dollar pool.

The problem is actually very complicated. The British position is that they would be ruined by any change in the system and cannot afford in their desperate condition to take a chance on returning to a freer world trade basis. The danger is that the system could be carried a step further and a dollar block created which would result in two mutual exclusive spheres of trade with a resulting smaller trade for everyone.

The Rt. Hon. H. V. Evatt, Australian Minister of State for External Affairs, in his address to the convention, presented the British side of it very effectively. In his address, he said:

"I now proceed to describe briefly and informally the Australian attitude to two problems which have been exercising the minds of many Americans in connection with our trade. These problems are our relations to the Sterling Area and the question of British Commonwealth tariff preferences. Before doing so I should make perfectly clear, if that is possible, that within the limits of economic necessity we are parties to these two arrangements of our own choice, and entirely of our own free will.

"If anyone still supposes that we are not possessed of full freedom in these respects he is many years out of date. As to all this, we are bound by no ties which we cannot agree to change, if our national and international interests should warrant any change, subject of course to the elementary proposition—elementary but often forgotten—that a multilateral agreement can be altered only by the free consent of all who are parties to it: And that no country can be expected to give such consent unless it sees clearly what the new situation will be if and when the multilateral agreement is altered or ended.

The Sterling Area

"We belong to what is called the Sterling Area. We have always done so, even in those days when a buyer of American goods had merely to go to his bank and buy dollars at the old par rate. But our dealings with foreign currencies were even then always through Sterling. It was a practical convenience. We left the worries of fluctuating balances between two countries to our friends in London, and when we called on them for dollars we got them. They kept a sort of informal dollar pool.

"When the war came, we found to our dismay that the dollar resources of our British kinsmen were no longer freely available to be used for normal trade either to us or to themselves. We found that the dollar pool had to be made strictly formal, and to be made subject to rationing. It suited us to put into and take out of this pool the dollars we earned and the dollars we needed, because on the whole we are a dollar deficit country. But we had to ration dollars with the rest. There was nothing secret or sinister

about it, nor anything significantly subordinate in the part which Australia took in the whole affair.

"The other matter I have mentioned is our system of preferential duties in favor of other British countries, and their systems with us. The Ottawa agreements are objected to because we admit into our respective countries goods at lower duties than importers from the United States have to pay. These agreements were consequential upon U. S. tariff action, upon the great depression, and upon the failure of the international economic conferences at the time. But the principle of preference goes much further back. It is associated with the histories, habits and sentiments of a particular family group of nations, and with their economic interests.

"If I may use a mechanical synonym which is well understood in your country, I may say that our economy is geared to a set of 'preferential' tariff systems, both for exports and imports, and we cannot scrap the gears without stopping the whole machine.

"In all of these trade problems we in Australia are hopefully anticipating a constructive and impartial lead from the United States, and from the Conference yet to be held. More, we are anxiously awaiting the outcome. If we are to find expanding world markets for our farm produce, and a reasonable share of them for our new industries, we can expect to buy more from others."

It is clear from this that the problem of the Sterling block and British Empire preferences will not be soon or easily done away with.

German Exports

Before the war, Germany ranked third among the nations of the world in export trade. Each year she exported close to $2 billion of manufactured goods. The greater part of this trade is now open to all comers and the opportunity exists for American manufacturers to get some of this trade.

As an example of what trade Germany had, in 1937 she shipped the following:

Cutlery	$ 15,230,000
Agricultural implements	22,450,000
Hardware	177,050,000
Machine tools	83,653,000
Textile machinery	54,419,000
Steam locomotives	6,033,000
Power machinery	26,545,000
Pumps, compressors	15,240,000
Material handling equipment	7,242,000
Electrical equipment	124,916,000

This trade was 68 pct to Europe, 7 pct to the British Empire countries, 11 pct to Latin America and the rest to Asia and the U. S.

Japanese export trade is now for all intents and purposes also eliminated. Japan ranked sixth among the world's exporting countries. She sold abroad an average of $850,000,000 of goods a year. In the year 1938, she sold the following:

Minerals and manufactures	$ 7,000,000
Ores and metals	34,400,000
Metal manufactures	28,500,000
Machinery and allied lines	76,000,000

About 60 pct of this trade was with Asia, 18 pct with North America, 10 pct with Europe and the balance with Africa and South America.

Accompanying this article is a table which shows by percentages how small the imports into this country of manufactured goods in these industries have been and what percentage of total production went into export.

American export trade is today in a very sound position. The general expectation of foreign traders is for some years of good business and even after the initial heavy volume of sales that are expected it is anticipated that the level of trade will remain considerably higher than in the recent past.

The predictions of exports amounting to $10 or $12 billion in the immediate future are generally looked upon with skepticism by exporters. As far as they can see, the gold and dollar balances now in the hands of other countries of the world, although they are substantial, would not be sufficient for trade of that volume.

In order for this country to export, the countries abroad must have the means to pay. Their principal means of earning dollars is by sales to this country, by tourist trade and by services. It is too much to expect that they will be able to obtain a sufficient supply of dollar exchange to purchase from this country anything like $10 to $12 billion of exports.

PRODUCTION AND FOREIGN TRADE

Percentage of Imports and Exports to Total U. S. Domestic Production in Typical Industries, 1937

	Imports Compared with Domestic Production, Pct	Exports Compared with Domestic Production, Pct
Abrasives	8.1	21.2
Air compressors	0.16	15.0
Agricultural machinery and implements (excluding tractors)	1.8	7.2
Sugar mill machinery	2.2	78.6
Iron and steel structural shapes	2.4	5.7
Iron and steel plates and sheets	0.06	5.6
Steel rails	0.57	10.3
Cotton manufactures	4.0	3.4
Industrial chemicals	2.4	2.4
Copper sulphate	0.03	31.2
Acetone	None listed	21.7
Aluminum sulphate	0.06	7.6
Caustic soda	0.19	11.3
Paints, varnishes and colors	0.5	4.8
Passenger automobiles and chassis	0.42	5.8
Motor trucks, buses and chassis	Negligible	19.1
Tractors and parts	0.5	17.9
Radio apparatus	0.01	13.5
Telephone and telegraph apparatus	0.03	3.3
Leather,—finished	3.3	4.7
Rubber products	0.23	3.6
Storage batteries	0.01	3.6
Motorcycles, bicycles and parts	1.0	3.7
Typewriters and parts	0.3	33.0
Machine tools	0.6	36.9
Turret and engine lathes	None listed	28.5
Files and saws	0.9	12.6
Electric fans	None listed	4.0
Electric refrigerators,—household and commercial	None listed	8.5
Cotton ginning machinery	None listed	13.2
Textile machinery	2.9	10.9
Paper-mill and pulp-mill machinery	0.04	4.5
Blowers and ventilating equipment	None listed	3.2
Oil burners	None listed	7.1